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ABSTRACT

This document contains 11 papers examining the methodology and findings of a study of the virtual delivery of education throughout the world. "Introduction" (Glen M. Farrell) explains the study methodology, which entailed the identification of 10 global regions and commissioning of an individual in each region to write a paper describing the state of practice of virtual education in the region and the potential impact of virtual education initiatives on current practices in distance and open education. The authors and titles of the remaining 10 papers are as follows: "The Development of Virtual Institutions in Canada" (Glen M. Farrell); "Distance and Virtual Learning in the United States" (Peter J. Dirr); "Distance and Virtual Learning in the Caribbean" (Peter J. Dirr); "Open and Distance Education Programmes in Latin America" (Victor Guerra Ortiz); "European Trends in the Virtual Delivery of Education" (Robin Mason); "Virtual Institutions on the African Continent" (Vis Naidoo, Casper Schutte); "Virtual Institutions in the Indian Subcontinent (Including Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka)" (Sugata Mitra); "Virtual Institutions in East and Southeast Asia" (Michael Robertshaw); "Virtual Education Institutions in Australia: Between the Idea and the Reality" (Suellen Tapsall, Yoni Ryan); and "Trends in the Virtual Delivery of Education in New Zealand and the Pacific Islands" (Lalita Rajasingham). (MN)

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The Development of Virtual Education: A global perspective

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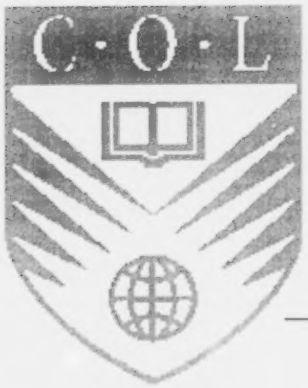

The Development of Virtual Education: A global perspective

A study of current trends in the virtual delivery of education, conducted with funding provided by the Department for International Development, London, U.K.

DR. GLEN M. FARRELL,
STUDY TEAM LEADER AND EDITOR

The Commonwealth of Learning
Vancouver, Canada

THE COMMONWEALTH *of* LEARNING

The Commonwealth of Learning is an International Organisation established by Commonwealth Governments in September 1988, following the Heads of Government Meeting held in Vancouver in 1987. It is headquartered in Vancouver and is the only Commonwealth intergovernmental organisation located outside of Britain.

The purpose of The Commonwealth of Learning, as reflected in the Memorandum of Understanding, is to create and widen access to education and to improve its quality, utilising distance education techniques and associated communications technologies to meet the particular requirements of member countries. The agency's programmes and activities aim to strengthen member countries' capacities to develop the human resources required for their economic and social advancement and are carried out in collaboration with Governments, relevant agencies, universities, colleges and other educational and training establishments among whom it also seeks to promote co-operative endeavours.

The Chairman of the Board of Governors is Dr. H. Ian Macdonald and COL's President and Chief Executive Officer is Dato' Professor Gajaraj Dhanarajan.

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Foreword

This study, *The Development of Virtual Education: A global perspective*, is but a snapshot of the state of virtual education at a given point in time. The rapid rate at which the new technologies are changing in character, cost, and capacities makes it difficult for any study to remain valid in perpetuity. When The Commonwealth of Learning, with financial assistance from the Department for International Development, U.K., commissioned this study, we were aware of the time sensitivity of the data that would be collected. Still, we were convinced that there was merit in proceeding, for two reasons:

- Despite the ever-changing nature of the technological environment, some valuable lessons can be learned from those pioneers currently practising virtual education.
- On the basis of those lessons learned, The Commonwealth of Learning can take steps to further benefit Commonwealth education.

This study clearly responds well to both these reasons. As the 10 reports in the study reveal, even though current participation in virtual education is modest, the potential for spectacular growth in, and application of, this new way of teaching and learning certainly exist. Nowhere is the need greater to apply these new technologies than in many parts of the Commonwealth where the gap between the supply and demand for education is so great.

For The Commonwealth of Learning, the study clarifies where we could be most helpful in our interventions around the Commonwealth. Such interventions need not be limited only to helping build Commonwealth capacity in virtual education; they could also include using current experience, available technologies, and knowledgeable people to deliver training and education in selected areas which, for various reasons, could not be achieved in one or another nation of the Commonwealth.

The Commonwealth of Learning is greatly indebted to Dr. Glen Farrell, Study Team Leader and Editor, and the expert group that came together to undertake this study for us. Together they brought a wealth of experience and great commitment to this assignment. We are also grateful to Ms. Myra Harrison and Mr. Jim Butler of the Department for International Development, U.K., as well as the Department itself, for their generous funding to undertake the study.

Dato' Professor Gajaraj Dhanarajan
President and Chief Executive Officer
The Commonwealth of Learning
June 1999

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The Commonwealth of Learning wishes to express its appreciation to the Government of the United Kingdom, through its Department for International Development, for providing the funding which allowed this study to be undertaken. For the implementation of the study, The Commonwealth of Learning is particularly indebted to those people who agreed to be members of the study team and provide reports on the status of the development of virtual education institutions in their region. Each of them is currently involved in some aspect of virtual institution development, whether as a teacher, scholar, entrepreneur, or in administration and policy development. Collectively they represent a wealth of knowledge and experience and, more importantly, they are all active students of the application of information and communication technologies to the process of education and learning. They are:

- **Dr. Peter Dirr,** President, Public Service Telecommunications Corporation, U.S.A.: *Distance and Virtual Learning in the United States,* and *Distance and Virtual Learning in the Caribbean.*
- **Dr. Glen M. Farrell,** Consultant, Development of Education and Training Systems, Glen Farrell & Associates, Vancouver, Canada: *Introduction* and *The Development of Virtual Institutions in Canada.*
- **Dr. Robin Mason,** Head, Centre for Information and Technology in Education, Open University, Milton Keynes, United Kingdom: *European Trends in the Virtual Delivery of Education.*
- **Dr. Sugata Mitra,** Research and Development Centre, NIIT Limited, New Delhi, India: *Virtual Institutions in the Indian Subcontinent (Including Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka).*
- **Mr. Vis Naidoo**, Director, Centre for Educational Technology and Distance Education, Ministry of Education, Government of South Africa, Pretoria: *Virtual Institutions on the African Continent.*
- **Dr. Victor Guerra Ortiz,** SchoolNet Coordinator, Latin American Institute of Educational Communication, Mexico: *Open and Distance Education Programmes in Latin America.*
- **Dr. Lalita Rajasingham,** Director of Programmes, School of Communications and Information Management, University of Victoria, Wellington, New Zealand: *Trends in the Virtual Delivery of Education in New Zealand and the Pacific Islands.*
- **Dr. Mike Robertshaw**, Programme Leader, School of Science and Technology, Open University of Hong Kong: *Virtual Institutions in East and Southeast Asia.*

- **Dr. Yoni Ryan,** Senior Policy Advisor (Flexible Delivery), Teaching and Learning Support Services, Queensland University of Technology, Australia: *Virtual Education Institutions in Australia: Between the Idea and the Reality.*
- **Prof. CJH Schutte,** Independent Education Consultant, Pretoria, South Africa: *Virtual Institutions on the African Continent.*
- **Mrs. Suellen Tapsall,** Senior Lecturer in Journalism, School of Media Communication and Culture, Murdoch University, Australia: *Virtual Education Institutions in Australia: Between the Idea and the Reality.*

Dr. Glen M. Farrell also served as leader of the study group and was responsible for the preparation of the final report.

1 Introduction

DR. GLEN M. FARRELL

Provision for education will be the biggest challenge for most governments as they attempt to attain the ideals of peace, freedom, and social justice, while striving at the same time to position themselves to generate more wealth and compete in the free global market. Bold steps have to be considered by states to provide their people with affordable access to education; using methods of mass education will be inevitable. Even by using these methods, not all aspirations will be met. Intervention by outside agencies is one solution, but it will come at a higher cost than most individuals in the developing parts of the world can afford. One solution available for Governments of the Commonwealth is to use the newer technologies as vehicles to bring a variety of educational opportunities to individuals in their respective countries. The knowledge, skills and a significant part of the infrastructure to create a *virtual campus* seems to be there in many jurisdictions but little is known of the what, why, and how of such operations.

(From *A Proposal to Study Trends in the Virtual Delivery of Education*, presented to the U.K. Department of International Development)

With that rationale, the Commonwealth of Learning proposed to the United Kingdom Department for International Development that a comprehensive study be made of the global state of practice globally of virtual education in schools and on campuses in order to achieve the following:

- Get a snapshot picture of what is being done by whom and where.
- Study the potential impact of such initiatives on a range of current practices.
- Provide Commonwealth Governments with information relating to technology and telecommunication infrastructure as well as financial and human resource needs for setting up virtual learning facilities.
- Enable existing distance education providers of the Commonwealth to re-engineer themselves to benefit from this emerging option.
- Review protocols and other administrative arrangements for awarding credits and credentials under special circumstances through Commonwealth co-operation in virtuality.

The Department for International Development agreed to fund the study and work began in September 1998.

Process and Methodology

The study is intended to provide a global snapshot of the state and practice of virtual education. It is not meant to be an exhaustive analysis of all virtual education initiatives. It should be seen as illustrative, based on the knowledge and perceptions of the individual members of the study team. We also see this as a work in progress because the interest and activity in the concept we have called virtual education is extremely dynamic.

The Commonwealth of Learning identified 10 global regions and commissioned an individual in each region to write a paper describing, from his or her perspective, the state of practice of virtual education in that region. Study team members were selected on the basis of their known interest, expertise, and experience in the development of virtual education strategies and models. The regional reports were completed in February 1999, and the study group convened during the first week of March in Brunei Darrusalam during the Pan-Commonwealth Forum on Open Learning to review regional developments and synthesise a global perspective.

The first task of the study team was to define the study parameters and agree on a working definition of virtual education (see Framework for Regional Reports in Appendix 1.1). This was a difficult task, and the definition initially agreed upon is admittedly broad. Making it more precise would have meant excluding a great deal of current practice that involves some exciting and creative use of information and communication technologies. Having now gone through the exercise of applying the definition, we have concluded that it remains a useful way to conceptualise the notion of virtual education. As development takes place, the definition may become more focused on those teaching and learning interactions mediated entirely through the application of information and communication technologies. At this stage, however, there are very few examples where that is the case.

Within the Framework (Appendix 1.1) team members were encouraged to develop their reports to reflect the context of virtual education development in their regions. Some of the reports focus on the state of information and communication technology infrastructure development in the region, while others (those where the infrastructure is readily available), provide examples of practice and discuss the related issues. Some team members, because of the size and complexity of their assigned regions and the lack of access to electronic data-gathering capacity, were compromised in their ability to make their reports as comprehensive as they would have wished.

(**Note:** Throughout this publication, universal resource locators (URLs) are included to permit readers to pursue additional information on sites and topics referenced. These URLs are valid Internet addresses as of March 1999. Due to the nature of the World Wide Web and the re-structuring of home pages by Web masters, the addresses might change by the time readers try to access the referenced sites. If you get an "Error 404" or "Invalid Location" message when you try to access a site, try removing the last part of the address to at least get to the home page of the host organisation.)

General Observations

The 10 regional reports reflect, not surprisingly, a great deal of variation in the stage of development of virtual models of education. Taken together, however, they do provide a world view from which the study team has distilled the following observations:

- The label *virtual* is widely and indiscriminately used around the world. Indeed, it is frequently used interchangeably with other labels such as *open and distance learning, distributed learning,*

networked learning, *Web-based learning*, and *computer learning*. Furthermore, it is used in some regions to refer to systems that combine broadcast and interactive teleconferencing technologies that operate in real time. With such broad use of the term, you need to know what the information and communication technology applications are in order to know what virtual education means in any given context.

- In spite of the increased use of the term *virtual*, there are very few examples of institutions using information and communication technologies to carry out all the functions included in our definition. The most common applications of information and communication technologies are found in administration, materials development and distribution, and where possible, student tuition in the form of student-student and student-tutor interaction.
- While there are still few examples of virtual institutions in the purest sense, the amount of development activity in all types and levels of educational organisations, both public and private, is considerable in all parts of the world. No one seems to doubt that the development and deployment of information and communication technologies will have a profound impact on access, institutional functioning, and the teaching and learning process. However, teachers and administrators have many questions and concerns (see the section below, The Global Context of Virtual Institution Development).
- The development of virtual institutions is still experimental, rather unfocused, and not necessarily matched to clientele learning needs. While there are some exceptions (e.g., the programmes offered in Communications Studies at the University of Victoria in Wellington, New Zealand), generally the applications of information and communication technologies tend to be unsophisticated. Commonly, for example, the World Wide Web is used by institutions simply as a publishing medium without addressing the interactive potential of the technology. This may be because little attention seems to be paid to the importance of staff retraining and development.
- There are some remarkable examples of the transformation that can take place when a vision for an educational system is developed and its implementation championed by decision-makers. Perhaps the clearest examples are the initiatives that have been taken in Korea (see Appendix 9.1 in *Virtual Institutions in East and Southeast Asia*).
- The emergence of virtual institutions is directly linked to the development of, and access to, information and communication technology infrastructure. However, major socio-economic and geographical disparities exist in such access. This disparity is perhaps the most critical issue of virtual education because those without access are likely to be increasingly disadvantaged in acquiring skills and knowledge. In spite of this obvious linkage, it seems that strategic planning for the development of information and communication technology infrastructure typically proceeds with little, if any, consideration for educational applications.
- The application of information and communication technologies to the provision of education is having a two-pronged effect on the marketing of education by institutions. First, there is now an emphasis on strategies that respond to niche learning needs rather than on a broad array of programmes to a common market group. In other words, the market is being fragmented. Second, there is an unprecedented degree of competition,

nationally and internationally, which is creating problems for those institutions that have historically used revenue from high-demand programmes to subsidise the low-demand programmes. Some jurisdictions are attempting to limit this growing competition through legislation, regulation, and accreditation requirements. However, the consensus seems to be that these measures will, at best, be effective only in the short term since the technologies being used do not honour political boundaries.

- It's generally believed that we will see the emergence of a relatively small number of international providers who will dominate the educational market through vast distribution networks and strategic partnerships. However, at this stage in the evolution of virtual institutions, this observation appears to be more rhetorical than real. While there is evidence of global providers and of their continuing emergence, there is, as yet, no indication that they will dominate the marketplace.
- The emergence of virtual institutions appears to be coming from four separate sources:
    1. Institutions that have historically been involved in open and distance education on a single mode or dual-mode basis.
    2. Traditional institutions, from schools to universities, that have never been involved in distance education. These institutions are now beginning to apply information and communication technologies to support their campus-based teaching in order to add quality and increase productivity and flexibility, with the belief that doing so may reduce costs and increase revenue by attracting new students. This transition is typically occurring on a programme-specific basis that, in many instances, is creating a virtual institution inside a traditional institution.
    3. The corporate sector. Many large organisations have developed internal training programmes based on information and communication technology delivery and, increasingly, they are marketing them using the virtual label.
    4. Individuals who, for reasons ranging from altruism to profit, are motivated to use the technology to create learning opportunities for anyone who is interested. This study did not set out to either document or describe the emergence of this form of virtual education; however, it is becoming commonplace on the World Wide Web and deserves to be identified.
- Cost reduction is frequently cited as an objective to be served through the introduction of information and communication technologies within educational institutions. However, there is a paucity of valid and reliable data on the question of costs.
- There is rapid emergence, particularly in North America, of new forms of virtual organisations that do not act as direct providers of educational programmes. This observation reflects the shift to institutions "unbundling" many functions, such as the development and distribution of learning materials, tuition, assessment, registration and record keeping, award-granting, learner support, and general administration. These functions can now be shared through a wide variety of organisational arrangements marked by specialisation and "added-value" partnerships involving both the public and private sectors.

The Global Context of Virtual Institution Development

The evolution of virtual institutions is occurring in the context of a wide range of forces that, on one hand, are driving the need for change, and on the other, serve to constrain change or at least slow the pace. These changes range from those that are regionally specific to those that are globally pervasive. The importance of any one of them is determined by the specific socio-economic context of a given state or nation.

Forces Driving the Development of Virtual Institutions

Factors that influence the development of virtual learning models are as follows:

- The increasing capacity, flexibility, and suitability of information and communication technologies to educational applications, together with the continuing decrease in the cost of hardware.
- The enabling capacity of the technologies to "unbundle" functions (as described above) that have traditionally been provided by one institution.
- The growth of knowledge, with its attendant consequence of the obsolescence of much of what was previously learned, placing an ever-increasing pressure on conventional models of education. People are seeking opportunities for lifelong learning, and with diverse personal circumstances, they require flexible access-to-learning opportunities and venues such as the home, the work place, the community learning centre, as well as the traditional campus-based institution.
- The realisation that the quality of the learning experience can be enhanced by applying information and communication technologies. In the conventional classroom we find increasing use of the Internet to access information, which enriches the learning experience. Further, in the conventional distance education environment, we find the technologies being adopted to improve the learning process through interactive and collaborative learning to reduce the learners' sense of isolation.
- The demand from isolated learners for more equitable access and service. This, of course, is not new, and was the reason for the development of correspondence courses. However, the context is broader now as the capacity of the technologies enables a remote, single-room school to access many of the instructional resources available to schools in an urban setting.
- The perception of many institutions, particularly in Europe and North America, that the application of information and communication technologies will enable them to increase their market share in an environment that is increasingly competitive.
- The need to be seen to be "keeping up with the competition." Administrators worry that student recruitment, donations, and grants may decline if this expectation is not met.
- The expectation by policy makers and administrators that the development of virtual delivery models will reduce costs, increase productivity, and enable expansion without cost increases.

Forces Opposing the Development of Virtual Institutions

Opposing those forces that are driving the emergence of virtual learning models is another set of values, beliefs, perceptions, and realities that serve to constrain the rate of change. The following are examples:

- In many parts of the world there is simply no access to networks and in many others

the cost of access is prohibitive. A related factor is the amount of bandwidth that can be accessed, which determines the possible information and communication technology applications.

- Many learners have no access to the necessary information and communication technology appliances such as computers, telephones, and televisions. Even within developed economies, the disparity of access is so great that many policy makers fear that adopting these technologies will result in a widening of the gap between the "haves" and the "have nots."
- Copyright restrictions on the use of instructional products and materials do not promote sharing through collaborative inter-institutional arrangements or through broad international delivery models.
- The front-end cost of implementing high-quality virtual models constitutes a major constraint, even if it is believed that ultimate savings are possible through standardisation, resource sharing, economies of scale, and increased productivity. The cost of initial hardware, operating software, and instructional material development typically require capitalisation funds that far exceed the resources of most institutions. In some cases the problem is dealt with through internal reallocation of funds (e.g., from library acquisitions to technology support). There is also a widespread practice of passing these costs on to the student through tuition fee increases or special levies.
- Current systems of learner support are not designed to function effectively in a virtual education environment, creating problems for all but the most capable of independent learners.
- Perhaps the most commonly reported constraint is the reticence of most teachers and faculty to embrace the use of information and communication technologies. Lack of training in the use of the technologies is the most frequently cited reason for the reticence. However, concerns over job security, the need for greater preparation as a result of operating in a public environment like the World Wide Web, plus the need to manage an increased amount of communications with students are also contributing factors.
- The educational philosophy of many teachers and faculty contributes to their reticence of communication technology applications. If they believe that learning should be structured and directed by teachers, then they are not likely to be attracted to using information and communication technologies, which enables a more constructivist or learner-centred approach to education.
- The transfer of course credits among institutions is a problem for those students who would like to undertake a programme that might be available through virtual methods but would require taking courses from several different institutions. From the students' perspective, this is a serious constraint on their ability to function as true virtual learners.
- Many people, particularly those who are younger and with less experience as independent learners, when given a choice prefer a traditional face-to-face learning environment. These learners tend to be more organised and vocal than older, part-time learners and, therefore, can be a significant political force against information and communication technology applications in education.

While the above list is not exhaustive, it should remind educational policy makers and managers that, in many respects, it is not the technologies themselves that are at issue, but the purpose and manner of their use that are likely to influence opinion of virtual education.

Emerging Models of Virtual Education

As stated earlier, the emergence of virtual education models is directly linked with the emergence of information and communication technology infrastructure. For example, the emergence of postal systems enabled by the development of transportation technology led to the development of correspondence models of education delivery. As the broadcast media evolved, first radio and more recently television, those technologies were applied to mass educational programming, typically those of a general and community education nature. Indeed many educators feel the potential for using these technologies has been, and remains, woefully under utilised. With the more recent development of real-time interactive media such as audio- and video-conferencing, there has been broad use of these technologies in formal education to reach under-served students. Applications have been particularly noticeable in North America and Australia. Now the phenomenon of the Internet and the World Wide Web is driving the broadest scope of interest and involvement in technology applications ever witnessed across all levels of educational institutions.

With each of these developments of information and communication technology, the once-separate models of open and distance learning and the so-called conventional, campus-based education has increasingly converged. Tapsall and Ryan have elaborated on this phenomenon in their report on Australia, *Virtual Education Institutions in Australia: Between the Idea and the Reality*, suggesting an interesting model for looking at its evolution. One result of the convergence of teaching models has been the emergence of new forms of educational organisations. These models are not mutually exclusive and undoubtedly others will develop quickly. Here are a few current examples:

- There has been rapid growth of virtual education within many so-called traditional institutions. Virtual programmes are offered by institutions that offer most other programmes in the traditional manner. More mature examples exist in the United States, Australia, and Canada; however, it is an emerging phenomenon in all regions.
- Single-mode distance teaching organisations, using primarily print-based delivery and created originally with relatively clear and exclusive mandates, are now confronted with having to reinvent themselves. On one hand, their once-exclusive mandates are evaporating, and on the other, they are constrained in the use of information and communication technologies because their students typically have difficulty accessing the necessary appliances.
- Broker-type organisations, designed to acquire or broker programmes from a variety of institutional providers and add value through flexible entry and credit transfer policies, are emerging rapidly. Two examples are the Public Broadcasting System (PBS) Going the Distance project in the United States and the University of the Highlands and the Islands project in Scotland.
- Information and facility provider-type organisations have emerged in response to the support needs of learners as well as those of institutions. Examples include the Queensland Open Learning Network in Australia, the University for Industry in the U.K., the Maine Network for Education Technology Service in the U.S., the Confederation of Open Learning Institutions of South Africa, European Study Centres, and the Sylvan Calibre Learning Network in the U.S.
- Institutions that are authorised to award credentials and to provide a variety of other services such as learning assessment, educational

planning, and learning records, but do not provide instruction directly to students, are becoming part of educational systems, especially in North America. Examples are Regents College in New York State and the newly created Western Governors University in the United States. (Note, however, that the latter is still moving through the accreditation process.)

It is noteworthy that while the United States never developed a single-mode distance teaching institution such as the U.K. Open University or the National Open School in India at either the state or national level, it is there that we are seeing the most prolific development of these newer institutional forms.

It is also noteworthy that these newer types of organisations, which are not focused on direct instruction, potentially transcend political, geographic, and legislative boundaries much more easily than the more traditional models.

The rapid growth of private sector providers is another dimension of the emerging model scene. These are three types:

1. Direct providers of instruction, usually with a focus on a particular niche market, have become prevalent and profitable. Examples are The University of Phoenix and Jones International University as described in *Distance and Virtual Learning in the United States*, and National Institute of Information Technology (NIIT) as described in *Virtual Institutions in the Indian Subcontinent.*

2. Corporate training networks, developed initially to meet internal training needs, are now exploiting external market opportunities and are increasingly seeking formal recognition for the training they provide. Examples include Quantas Airlines, as cited in *Virtual Education Institutions in Australia* and South Africa Telecom, as cited in *Virtual Institutions on the African Continent.*

3. Specialised service organisations that are focused on providing consultation, project management, technical support, and private tuition have evolved on a fee-for-service basis. Examples are the IBM Global Campus and the McGraw-Hill Learning Infrastructure, as cited in *Distance and Virtual Learning in the United States*, Virtual University Enterprises as cited in *European Trends in the Virtual Delivery of Education*, and Real Education, as cited in *Virtual Education Institutions in Australia.* (**Note:** Real Education no longer operates in Australia but remains active in the U.S.)

The phenomenon of the "tele-centre" or "tele-learning centre" is emerging as a hallmark of the virtual education environment. In concept it is not new; the idea of a community learning centre has long been a part of various models of adult education and was pioneered many years ago with the Scandinavian concept of "learning circles." However, in its current form the concept involves the creation of community-based access points where connectivity to networks is provided and access to information and communication technology appliances is made available. While applications may not be exclusive to education, the idea of the technology-based community learning centre provides an essential component of any virtual education system that aspires to be broadly accessible. Countries like India, which recently announced it will create information kiosks throughout the country, and South Africa, with its commitment to developing tele-centres, are examples of nations which have recognised the importance of ensuring access to citizens as a matter of public policy.

Although virtual education models have not yet influenced education at the primary and secondary levels in a pervasive sense, there is evidence that this will start to occur rapidly. Initiatives such as SchoolNet in Canada, SchoolNet

India, SchoolNet South Africa, and the Open School in British Columbia, Canada, are examples. The evolving model is likely to remain focused on classrooms, but with more flexibility in the role of the teacher. This role can be portrayed as a continuum, at one end of which technologies are used to support teachers and, at the other, teachers support learning where information is primarily accessed via information and communication technologies.

Change Strategies

Two visions of change in educational systems emerge from the regional reports in this publication. One portrays technology as an overwhelming driving force with the emergence of a few global providers dominating the educational market through vast distribution networks and strategic partnerships. The second involves a more explicit, policy-based approach at national and state levels which is concerned with issues such as equity of access, curriculum relevance to labour market needs, accreditation, consumer protection, and cultural sensitivity. These visions are, of course, not mutually exclusive as they can, and are likely to, co-exist. However, if they are to co-exist in a positive way, then it behooves educational policy makers to ensure that the educational leaders in their jurisdictions are making decisions in a careful manner and are managing the process of change as constructively as possible. Following are some strategies that the study team considers important:

1. Ensure that information and communication technology development planning is linked with educational planning so that the application is both appropriate and sustainable in terms of access to the infrastructure. Wherever possible, virtual delivery should be linked to the development of tele-centres to enhance access and add value to overall information and communication technology development.
2. Use policy, legislative, and regulatory incentives to ensure that some portion of telecommunication capacity (e.g., X% of cable channels or Y% of bandwidth) is reserved for educational use at costs that are affordable by institutions. If such incentives are available free of charge to accredited institutions, they will help ensure that educational applications become part of telecommunication infrastructure development.
3. Ensure that all facets of the concept of appropriateness are considered. In other words, the technology needs to be appropriate to the skills and characteristics of the target learners, the nature of the programme content, the current competency of the instructional staff, and available funding.
4. Show how the application of information and communication technology in education can enhance existing practice. If teachers perceive that a given application will help them accomplish their goals more efficiently and effectively, they will more likely change their behaviour and be motivated to acquire the necessary skills and knowledge.
5. Ensure that appropriate staff training and development programmes are available as an essential part of any change strategy.
6. If the purpose of increased utilisation of information and communication technologies is to achieve cost savings, ensure that there is a clear plan in place indicating precisely how such savings will be effected and whether they will be real savings rather than simply a transfer of costs to students.
7. Encourage differentiated mandates among institutions. There is an obvious cost benefit if complementary rather than competitive development can be achieved within educational systems.

8. Encourage and support initiatives of faculty members. Change, particularly within conventional institutions, often occurs at the initiative of the individual teachers rather than by strategic decisions taken by the institutions.

9. Consider how or whether institutional functions can be "unbundled," particularly between those functions related directly to the provision of instruction, and those that relate to materials development and learner support. The goal is to enable the partners to focus on what they each do best—their "core business."

10. Recognise that the development of virtual education models will create change forces in a variety of other ways:

    - Advising and counselling may need to be managed differently.
    - Concerns over the quality assurance of providers using information and communication technologies will develop as new players become involved.
    - Issues of credit recognition and transfer will arise between institutions.
    - Demands from learners for assessment of existing skills and knowledge will become commonplace.
    - Decisions related to the allocation of funds will increasingly be between the costs of "bricks and mortar" on one hand, and the cost of "bandwidth" on the other.

11. Effective incorporation of the technologies requires a commitment by all parts of an institution. For example, the offering of courses on-line will be diminished if the registry insists on "hard copy" processes.

Summary

As stated at the outset, this study was designed as a "snapshot" of current practice and the state of development of virtual education. Given the dynamic nature of information and communication technology, the examples cited date very quickly. However, what will endure is the phenomenon of change that educational institutions at all levels, and in all parts of the world, are experiencing. The decisions that face educational leaders and practitioners are no longer simply intra-institutional; increasingly they are systemic and international in scope and involve some aspect of technological application. The world of education has become a smaller place and, like it or not, more interdependent.

However, just as the emerging information and communication technologies have made the educational decision-making environment more complex, so have they led to a great deal of conventional wisdom regarding their application. We cannot over-stress the importance of the concept of appropriateness when making decisions about information and communications technology applications. This study has revealed nothing if not that the use of information and communication technology should be in the context of clearly stated educational outcomes accompanied by practical strategies for achieving them.

Appendix 1.1: Framework for Regional Reports

1. A Virtual Education Institution may be defined as:

   (a) An institution which is involved as a direct provider of learning opportunities to students and is using information and communication technologies to deliver its programmes and courses and provide tuition support. Such institutions are also likely to be using information and communication technologies for such other core activities as:

   - Administration (e.g., marketing, registration, student records, fee payments, etc.)
   - Materials development, production, and distribution
   - Delivery and tuition
   - Career counselling/advising, prior learning assessment, and examinations

   (b) An organisation that has been created through alliances/partnerships to facilitate teaching and learning to occur without itself being involved as a direct provider of instruction. Example of such organisations would be the Open Learning Agency of Australia, the emerging Western Governors University in the United States, and the National Technological University.

2. The scope of the study should not be limited to universities. Examples of virtual institutions may include both the public and private sector and may focus on elementary, secondary, or tertiary levels as well as non-formal learning and continuing professional education such as teacher upgrading.

3. In addition to describing the nature of the virtual institutional examples and the nature and context of information and communication technology applications, reports should also consider comments on issues such as:

   - Technology infrastructure limitations that have been experienced
   - Financial impacts
   - Human resource requirements
   - Learner acceptance
   - Teacher acceptance
   - Reactions of conventional institutions
   - General demographic characteristics of learners being served

4. Some institutions or states may have plans for developing virtual institutions which are not yet operational. These should be included in regional reports if doing so would provide a more complete picture of developmental trends in the region.

2 The Development of Virtual Institutions in Canada

DR. GLEN M. FARRELL

The Context

Educational institutions at all levels in Canada face a common set of challenges: decreased financial resources, increased diversity of their students' learning needs and preferred learning styles, increasing demand for more accessible programmes with more relevant content, and increasing competition from other providers.

In response to these pressures, Canadian institutions are increasing their use of information and communications technologies (ICT). For some the goal is to improve the quality of their current distance education delivery models. For others, particularly the more traditional universities, it is to enrich the quality of the on-campus learning experience, to improve access, or to meet perceived competitive forces. Further, many administrators and policy makers believe that by making use of these technologies, they can reduce costs or increase enrolments without increasing costs.

However, the current state of ICT development is an extremely important variable influencing the development of virtual education. For example, limited access to bandwidth at affordable rates has meant that text remains the primary format for materials. Given that extensive reading of print on screen is difficult for many people, content material is most often provided in hard copy with the Internet being used for conferencing purposes, access to supplementary databases, assignments, and administrative support. Full multimedia and, therefore, pure virtual learning, will evolve as bandwidth becomes more technically and financially accessible.

Education theory is also affecting the evolution of virtual institutions in Canada. The debate between those who believe learning should be structured and directed by teachers and those who believe that students should take more responsibility for their own learning is not new. Until recently, the state of development of ICT has not facilitated the latter as much as it has the former, with the result that the technologies have been used predominantly to extend the teacher-directed model (e.g., online video-conferencing). However, with increasing demand for competencies such as critical thinking, knowledge creation, teamwork, and collaborative learning, together with the ability of technologies to enable much more learner initiative and control, the debate is occurring in a different context. For those teachers who have viewed themselves as the centrepiece of their students' learning experience, combining the two approaches requires a major shift in both behaviour and self-concept.

Of all the terms used to describe the increasing use of ICT in Canada, *virtual* is perhaps the least common. Other terms being used, besides

distance and open learning, include *on-line learning, distributed learning, network learning, independent learning, cyberschooling, and tele-learning.* Some newly created institutions, such as the Technical University of British Columbia and Collège de L'Acadie in Nova Scotia, are defining themselves as virtual 21st century organisations. Established distance teaching institutions, such as Télé-Université in Quebec, Athabasca University in Alberta, and the Open Learning Agency in British Columbia, which were originally entirely print-based with telephone tutoring, are moving rapidly to Web-based delivery. However, they are still more likely to refer to themselves as distance teaching or open institutions.

All of the so-called traditional institutions are now using these technologies, or are planning to in the near future, for instructional purposes. For some the focus is on a particular programme (e.g., the M.B.A. programme from Queen's University delivered across Canada using a combination of video-conferencing and e-mail). For others, it may involve using the technologies to enrich learning that is essentially classroom-based by enabling more access to remote databases, access to instructor notes, or more collaboration among learners. Most of these institutions do not refer to these activities as virtual; on the other hand, there are those that have developed a few courses for Web delivery and very proudly call themselves virtual institutions.

Perhaps surprisingly, the most frequent use of "virtual" to describe the burgeoning use of these technologies is found in the schools sector (K-12). Several provinces have created an infrastructure to provide services to individual schools as well as directly to students. Examples are the Alberta Distance Learning Centre and Ednet in Alberta and the Open School/ Regional Distance Education Schools Partnership in British Columbia.

The private sector is also emerging as a significant player in virtual models of training and education. Canada has seen tremendous growth in the number of private schools and colleges focusing on training in the ICT industry. They use technology to deliver their programmes and frequently describe themselves as virtual organisations. Furthermore, the corporate world is making extensive use of ICT for internal training, recognising that keeping the skills and knowledge of their workforce current is an essential part of their business strategy. In fact, this has become such an important component that many larger organisations have established their own Intranet because of the proprietary nature of the content of their training programmes. Some describe these systems, and the programming they offer on it, as their "virtual university."

A recent report from the Office of Learning Technologies describes critical success factors in the use of "learnware" in the private sector, particularly by medium and small enterprises. Based on eight case studies, the report describes these factors as follows:

- Partnerships involving both private and public organisations in the development and delivery of learning products.
- A thorough analysis of learner needs prior to development.
- Content of the learnware is realistic and credible to the target audience.
- Creation of a sufficient market in terms of partnerships, right pricing, and broad business-based approaches to marketing of the learnware.
- A delivery format that is appropriate for the target market.
- Links to accreditation in the form of certificates or degrees is important from a motivational standpoint and in the development of industry standards.

Under the Canadian constitution, the federal government has a very limited role in education. Therefore, most initiatives are at the provincial

level and are driven by several factors such as the need to increase accessibility and control capital expenditures and the pressures from parents and students who are dissatisfied with the public education system and who are demanding more flexibility in delivery options.

However, no comment about the context in which the concept of virtual education is evolving within Canada would be complete without mentioning some of the national programmes. The following is not an exhaustive list, but it illustrates the types of initiatives that are having a major impact on the evolution of virtual education and training.

- *The Office of Learning Technologies*, established within the Department of Human Resources Development Canada, works with provincial governments, institutions, private sector organisations, and non-governmental groups to promote the effective use of learning technologies, support assessment, and research related to the educational use of technologies, and to help in the sharing of knowledge and experience.
- *SchoolNet* led by Industry Canada, is an initiative of the federal and provincial governments, Canadian businesses, and the Canadian learning community. The objective is to enhance educational opportunities through the use of the Internet. SchoolNet services include teacher-designed networking projects, virtual environments for situation-based learning, online career materials, special pricing for hardware and software, and access to university and college course materials.
- *The Telelearning Network of Centres of Excellence*, headquartered at Simon Fraser University in British Columbia, is the only national research programme in the world that is examining networked learning across all educational sectors, from kindergarten to adult continuing education. It involves an interdisciplinary team of over 130 researchers at 30 universities working with approximately 160 private and public organisations across Canada. Its mission is to research, develop and demonstrate effective knowledge-building pedagogies that can be implemented through tele-learning to support the development of a knowledge economy. A list of the projects underway is available from Simon Fraser University.
- *The Canadian Association for Distance Education*, an organisation for professionals working in distance education, has its membership from all sectors of public education, industry training, hardware and software distributors, and network providers. It is very active in organising conferences and workshops, promoting research, and using its listserv to facilitate collaboration and information sharing.

These types of national organisations are perhaps more important in the Canadian context because of the exclusive provincial jurisdiction over education. They enable networking and partnerships both regionally and nationally that would otherwise be difficult.

Current Canadian Examples of Virtual Education

There are a great many exciting initiatives underway in Canada under the rubric of virtual education—far too many to attempt to list them all. The examples that follow, therefore, are intended to illustrate the range of virtual education developments that are occurring.

SCHOOLS SECTOR (K-12)

- *Alberta Distance Learning Centre (ADLC)*, a branch of the Ministry of Education, provides distance learning programmes to students throughout the province and offers online learning opportunities through its

Online School. Students registered in the school study from print-based materials and, for science courses, science lab kits. They work independently with frequent interaction with teachers. Students are supplied with a computer, which has CD-ROM, modem, Internet browser, conferencing, fax, and printing software. Virtual "chat rooms" are available for students to work collaboratively and for parents to discuss educational issues. Counselling services, technical training, and ongoing support are provided for both students and parents. Future plans call for the use of new technologies that will allow posting of course materials while providing synchronous audio, whiteboard, and application sharing between "virtual classes" of students and an ADLC online teacher.

- *The EDEN Project (Electronic Distributive Education Network)* has been developed by a consortium of six major district school boards in Ontario. The project provides a full service educational Web site offering online high school credit courseware and delivery for use by teachers and schools anywhere in the province. It is particularly useful for adults and teenagers who cannot access the traditional classroom, for small schools that cannot maintain a full programme of traditionally taught courses, and for school-based students who could benefit from a more flexible, individually based learning environment. A pre-service electronic access course is provided so students can develop the necessary telecommunication and tele-learning skills needed to succeed in this environment. A programme of teacher training is also part of the implementation strategy. Students must have access to a computer that meets project specifications. Client software is provided to enable conferencing, e-mail, discussion groups, and real-time teleconferencing with a shared whiteboard. Content is provided in a sequenced manner with files that can be executed and downloaded and which include hyperlinks to the Web for research. Self-assessment is built into the process with teachers having the capability to monitor and intervene.
- *New Directions in Distance Learning (NDDL)* is a programme offered by the Open School (a division of the Open Learning Agency in British Columbia), which offers high school graduation programmes to students in small schools, learning centres, and at-home learners in the province. The programme operates on a triad model with the student, an on-site facilitator, and a teacher (at a distance) working together to ensure the student is supported and remains motivated. Students can work independently towards secondary school completion using computer conferencing, e-mail, audio-conferencing, audiographics, television broadcasts, and print material with study guides and resource materials available online. Tutorials with individual students or small groups are conducted using interactive broadcast and desktop conferencing tools.

College Sector

- *Mount Royal College* in Calgary, Alberta is a leader among Canadian community colleges in developing virtual models of programme delivery. Its Centre for Health Studies, for example, has been offering distance education opportunities for more than a decade. It now delivers four certificate programmes using a combination of print materials, instructor/student telephone conferences, e-mail, computer conferencing, and selected audio and visual materials. It is currently developing its programme in critical care nursing for Web delivery.

- *George Brown College* in Ontario, like almost all of Canada's colleges, offers many courses using synchronous audio/video conferencing, correspondence, CD-ROM, and Internet conferencing . However, the college has also developed a complete Electrician Technician Certificate Program for delivery via CD-ROM. This includes 23 courses complete with text, video animation, computer-based testing, and lab software animation packages. It can be purchased for individual use and is the equivalent of the standard two-year programme.
- The *Collège de l'Acadie* was created in Nova Scotia to serve the learning needs of both Acadian and Francophone communities in the province. The College has established a network of learning centres which now includes the Province of Prince Edward Island. These centres are linked through dedicated audiographic and video-conferencing systems, as well as the Internet, which allows point-to-multipoint teaching, student conferencing, and e-mail. All students have Internet access and their own e-mail address. A special partnership with Collège de Rosemount in Montreal enables Collège de l'Acadie to offer technology -supported senior high school courses. The example of Collège de l'Acadie, while not unique among Canada's colleges, illustrates the emergence of virtual institution networks that enable a single institution to serve a wide geographic area.
- *Kayas College* is a creation of the Little Red River Board of Education in Alberta. Challenged with a mandate to serve the educational needs of the many Cree Nation communities spread across Western Canada, the Board conceived the idea of a virtual college with learning centres in many communities linked together through a common video-conferencing system. Programmes in Native Studies, adult upgrading, computer training, and teacher assistant training are offered with remarkable results in terms of attendance and student success rates.

UNIVERSITY SECTOR

- *Athabasca University*, in Alberta, *Télé-Université* in Quebec, and British Columbia's *Open University*, are Canada's three universities that deliver all their programmes through various distance teaching systems and methods. While none of these institutions describes themselves as virtual, preferring instead the labels of "open" and "distance," they are rapidly evolving as virtual institutions according to the definitions used in this study. Each began 20 to 30 years ago using print course packages combined with telephone, mail, or site-based tutoring. As broadcast television and audio- and video-conferencing technologies became available, they were incorporated into delivery models on a practical basis considering costs, student access to equipment, and acceptance by the instructional staff and learners. Indeed, the Open University and Télé-Université were Canadian pioneers in the use of broadcast television.

  That practical approach to the adoption of ICT continues. Currently all three institutions use a mix of technologies: conferencing software, the Internet, the World Wide Web, audio- and video-conferencing, radio, television, and print (the last still being a major component of their delivery systems). Nevertheless, it is these three institutions that are at the forefront of large-scale application of virtual delivery systems. Athabasca, for example, has the largest M.B.A. programme enrolment of any university in the country. The programme is offered entirely online using Lotus Notes via the Internet to students from across

Canada as well as internationally. Through the Open University it is now possible to take a full programme of first- and second-year degree courses through a combination of print packages and online tutor conferencing. By the spring of 1999, there will be 29 courses ready for full Web-based delivery, including a certificate programme in Workplace Training. Similarly, Télé-Université is converting to Web-based delivery.

- *Queen's University* in Ontario, one of Canada's most respected "traditional" institutions, provides an interesting example of the application of information and communication technology to a specific programme. Several years ago, Queen's decided to offer its M.B.A. programme to students across the country using multi-point interactive video-conferencing. Sites were established in several larger cities where students meet for "real time" lectures and discussions. This model has been supplemented by providing students with desk-top computers pre-loaded with the necessary software to allow students to work in teams, download and upload assignments, interact with faculty, and network with the video-conferencing system regardless of where they may be. This feature was an important development given that most students in the programme are employed in management positions and require more flexibility in their learning environment.
- *University College of Cape Breton* in Nova Scotia is a good example of a dual-mode institution with a history of community outreach, increasingly through the use of information and communication technology. It is now offering a graduate-level certificate programme in educational technology entirely on the World Wide Web.

Finally, individual faculty members at many universities, the University of British Columbia among them, are making extensive use of Intranets as well as the Internet to accomplish two objectives: First, they are making lecture notes available asynchronously to students to enable filing assignments and to provide feedback. Second, they provide "hot links" via the Internet to other databases for research and course content enrichment.

The Emergence of Virtual Organisations

The challenges identified at the beginning of this report are not only causing institutions to increase the use of ICT, but also to seek partnerships that offer the opportunity to reduce costs, increase market share, or add value in other ways such as enhancement of programme quality. This task becomes easier as the technologies enable an "unbundling" of functions that have historically been handled within a single institution. Functions such as advising and counselling, assessment of current skills and knowledge, learning plan development, provision of instruction, maintenance of learning records, and the issuance of credentials can now be managed through virtual arrangements among a group of institutions with complementary services. These arrangements may be permanent or short term, depending on needs.

These types of arrangements are developing most rapidly at the level of trade and technical programmes. For example, the Canadian Association of Technologists has defined various levels of professional certification and associated competency standards. They are developing arrangements with a variety of private and public organisations to provide services such as skill assessment, training opportunities, and credit transfer opportunities. By defining standards, awarding certifications, and brokering partnerships with

other organisations for assessment and delivery purposes, the association is, in effect, functioning as a virtual institution.

The Open Learning Agency (OLA) in British Columbia has developed the Canadian Learning Bank to serve lifelong learners who need advice on career paths, training and educational opportunities, assessment of current skills and knowledge, assessment of credentials earned outside of Canada, and consolidation of their learning record. This last service, a "record of learning," is turning out to be the most critical start-up service. OLA does not intend to provide all such services itself. Rather, it is entering into a variety of arrangements with other organisations that offer complementary services. An example is a recent agreement with the University of Cambridge Local Examinations Syndicate to provide secondary school-level competency testing.

Contact North is Canada's largest distance education network. It facilitates access to education at all levels in 100 communities across northern Ontario by enabling other institutions to offer the needed programmes through the technical networks it operates and manages. Part of its management role involves the co-ordination of information to prospective learners, central facilitation of registration, and training for the appropriate use of ICT.

A long-standing example of this type of virtual organisation at the university level is the collaboration between three of British Columbia's "traditional" universities (University of British Columbia, University of Victoria, and Simon Fraser University) and the Open University. Through this arrangement, a student may take distance education courses from any of the institutions and have the credit applied to an undergraduate Arts degree awarded through the Open University. This collaboration has the obvious advantage of providing the student with a great deal of flexibility and, from the institution's perspective, it reduces costs through less duplication of materials development costs and by maximising enrolments in any given course.

Another example is Newfoundland's Telemedicine and Educational Technology Resources Agency (TETRA). Begun years ago as an audiographic network for use by physicians in remote communities, it is now a multi-channel network used by both health and educational providers. It includes a Virtual Design Centre, jointly supported by the Royal Bank and Memorial University, through which experienced instructional designers and media specialists in the university work with peers from the College of the North Atlantic and with colleagues from private media and design firms to create media-based learning materials.

Summary

As a reason for creating its Institute for Learning Technologies, Mount Royal College in Calgary states that:

> Teaching and learning will become profoundly rich, complex, and diverse. Educational institutions will share an educational role with corporations and a host of newly emerging educational providers not bound by classrooms, institutional settings or borders—nor even by time itself—in a global, knowledge-based economy that is already shaping our lives.

This vision is widely shared among educational leaders and policy makers in Canada. It is the vision they have in mind when they use the term "virtual learning." It doesn't mean, however, that they believe that the traditional learning formats we have now will all give way to virtual learning. Rather, it is seen as expanding options for learning, options that will continue to include campus and school-based face-to-face instruction along with the electronic classroom that can

be accessed through a computer from home, the work place, or a community learning centre.

The implementation of this vision presents a variety of both opportunities and challenges. S.D. Wynne, in "An Overview of Virtual Schooling in North America and Europe" (a report to the Open School Division of the Open Learning Agency, November 1997), summarised these opportunities and challenges for elementary and secondary schools. They can be generalised to the Canadian experience at all levels.

The **opportunities** include:

- Increasing the focus on interactivity
- More individualised instruction for students
- Enhanced time and place flexibility
- Greater potential for students to reach global audiences
- Potential for greater cost effectiveness
- Better provision of computer and technology skills

The **challenges** raised are:

- Concern over adequate socialisation for some students
- Lack of technology standards/requirements in teacher training
- High costs of technology
- Problems of equity of access for those who are not computer literate or don't have access to computers
- Resistance by some teachers and administrators
- Inability for some students to function in a less structured environment

While these observations sum up the experience of "virtual education" development in Canada to date, realising the opportunities and meeting the challenges will require attention to specific issues rather than generalities.

Technology

The use of ICT across the Canadian educational map is increasing rapidly. At the institutional level it tends to begin with applications that allow the institution to replicate the classroom to the greatest extent possible. In other words, the acceptability of "doing things virtually" is greater when the use of the technologies reinforces the existing way of doing things—at least at the outset. Further, and perhaps more appropriately, the use of the technologies is limited by the lack of access to bandwidth at affordable rates and by inequity of access on the part of learners to the necessary appliances such as computers.

Financial Impact

The implementation of virtual learning is proving to have significant cost implications. Two factors that serve to increase costs are the development of instructional materials for media-based delivery and the costs of training or retraining the teachers and staff. There are both front-end capitalisation costs as well as operating costs such as network access and equipment maintenance. These increases are predictable in any application of ITC where the development of virtual learning is treated as an "add-on" to existing educational practice, and where the opportunities for economies of scale are not achieved within the institution or through external partnerships. However, the analysis changes considerably if the full costs of operating a traditional institutional structure (e.g., space, staff, operations, transportation, etc.) are considered, particularly when these types of costs are increasing while the cost of the technologies is declining.

The cost-effectiveness debate changes when it shifts from a cost/student analysis to a focus on the costs of increasing the completion rates among distance education learners. The evidence is mounting from evaluation studies in Canada and elsewhere that the increased flexibility and

interactivity offered through virtual delivery models results in increased satisfaction and completion rates.

Human resource impact

The major impact is on the role of the teacher. The evidence is clear that the willingness of teachers and faculty to adopt the use of ITC and to change their pedagogical strategies is a major determinant of the speed of development of virtual education models. Attention to training needs and the fostering of an organisational climate that rewards innovation is critical. So also is the need to ensure that instructional design and technical support expertise is not only available to support teachers, but also to lead the process of change. Indeed, some Canadian educators view the lack of an available pool of instructional designers as a significant constraint to the development of virtual models.

Learner and teacher acceptance

Feedback from learners tends to be positive, provided that there are no major technical problems and that the content is relevant and credible. They cite increased flexibility and equity of participation (especially among females) as reasons for preferring a virtual education experience.

There do not seem to be any generalisations that can be made concerning the demographics of the learners. Many of the statements made about the learner characteristics required for success in a distance learning environment are not valid in the context of virtual learning, primarily because the isolation factor, that has long been a criticism of distance education, has changed. Indeed, as well as the increased flexibility and equity of participation, students also applaud the greater opportunity for discussion and collaboration that they have through a virtual model.

Teacher and faculty acceptance should be evaluated from both an individual and collective perspective. On one hand, much of the innovation in virtual learning in Canada, across all educational sectors, is the result of the vision and determination of individuals who have had the support of administrators. As with the adoption of any innovation, they are the ones who want to be at the forefront of change and tend to pave the way for those who follow. On the other hand, teacher and faculty organisations have generally been extremely cautious about supporting the increased use of technology. Generally they see their mandate as ensuring the welfare of their members in a time of rapid change, and that, they argue, is best done through a "go slow" approach that will enable the consequences of change to be more predictable.

Acceptance of conventional institutions

What a difference a decade makes! Less than 10 years ago the deans of the graduate schools of the universities in Western Canada passed a resolution that would deny admission to their schools by any applicant who had taken any of their undergraduate courses through distance education. Although they were quickly brought to heel by their presidents and the respective provincial ministers of education, the anecdote illustrates the attitudes that prevailed not very long ago. Fast forward 10 years and we find every one of those institutions not only using information and communication technologies in both their on-campus and off-campus teaching, but often providing leadership in the development of virtual learning through research and application. In fact, one could argue that the leadership for the evolution of virtual learning may well shift in the next decade from the so-called single-mode distance education institutions to some of those institutions that used to be called "conventional."

Market opportunities

The development of virtual learning models is having perhaps its most significant impact on education through the creation of new market opportunities. The effect of "unbundling" the many functions involved in the education process that historically have been performed by a single institution means that there are many more specialty roles that can be performed by associations, non-governmental organisations, government departments, entrepreneurs, for profit businesses, and the educational institutions that have long enjoyed the monopoly. Here are just a few examples of these market opportunities:

- Developing instructional materials
- Assessing skills and knowledge
- Accreditation, awards, and granting credentials
- Brokering learning opportunities that are provided by others
- Providing learner support services such as advising/counselling, planning, and offering a record of learning
- Managing a knowledge database
- Franchising programme delivery
- Developing partnerships to address specific market opportunities such as continuing professional education

Examples of all of the above initiatives are now part of the Canadian educational scene.

Finally, it must be remembered that the development of virtual learning is not turning out to be the "silver bullet" that many Canadian educators and policy makers expected. The use of technology does not reduce costs automatically, nor does it always improve the learning experience. The benefits are available only when there has been a thorough analysis of the results to be achieved, the inputs necessary to achieve them, and the technologies that are most suitable. Only then can the question of the appropriateness of a given strategy be addressed and the cost effectiveness of implementing it assessed.

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3 Distance and Virtual Learning in the United States

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Introduction

There has been an explosion of interest in distance and virtual education in recent years in the United States. In one sense, this is a recent phenomenon, coinciding largely with the evolution of the World Wide Web as a commercial communications vehicle. In another sense, however, this could be said to be the fourth generation of distance education in the U.S.

The first generation was the introduction of correspondence education in the 1800s, especially its use by the land grant universities starting in the late part of the century to deliver agricultural education to farmers in rural areas. The second generation came with the introduction of television to deliver educational opportunities to all people in their homes. This stage began with the commercial television offering of *Sunrise Semester* and *Continental Classroom* in the 1950s and expanded with the introduction on public broadcasting of tele-courses in the 1970s and 1980s, reaching its apex with the quality courses of the Annenberg/CPB Project in the 1980s and early 1990s.

The third generation emerged in the late 1980s when colleges and universities began to sporadically offer online courses when the Internet was still largely funded by the U.S. government and was a "club" of university faculty and military personnel. This was an era of experimentation and searching for ways to use the reach of the Internet while still taking advantage of all that had been learned from the two preceding stages.

As we approach the end of the 20th century, distance education in the United States is entering its fourth generation with the introduction of complete "virtual programmes" of study. Until institutions of higher education (IHEs), which includes both colleges and universities, achieved a critical mass of online courses, it was difficult to know what impact virtual education would have in the United States.

This paper examines selected leading-edge initiatives in distance and virtual education in the United States at the close of the 20th century. It does not pretend to be a comprehensive study of all virtual education programmes in the country. In fact, for every institution included in this paper, there are dozens that have not been included.

The programmes described in this paper share some common characteristics:

- They are complete programmes, that is, they offer complete degrees, certificates, or diplomas.
- They rely entirely or substantially on information and communications technologies (ICT) to deliver and support instruction.

- They are all "leading edge," that is, they exemplify some of the more advanced applications of the pedagogical approaches and technologies being used in distance and virtual education today.

The focus is on virtual degree programmes, which reflects the condition of education in the U.S. today. For the most part, we do not have freestanding distance education institutions, but rather distance education programmes embedded within traditional institutions, or dual-mode institutions. According to recent studies, approximately four out of five traditional IHEs now offer distance education courses.

This paper also describes a few applications at the elementary/secondary level as well as applications in business and industry, primarily for professional development and workforce training.

The Context

Some broad trends in education in the United States provide a context for better understanding the examples of distance and virtual education in later sections.

Interesting educational statistics

Contrary to what some might think, higher education is still not universal in the U.S. Of the 160 million adults in the country, 54.8% have a high school diploma or less, 18.7% have some college but no degree, 19.3% have an associate or bachelor's degree, and 7.2% have a graduate degree. (These and the following statistics are taken from *The Chronicle of Higher Education Almanac*, August 26, 1998.)

Higher education in the U.S. is highly diversified. There are no "national" universities funded and operated by the federal government (although a few specialised institutions, such as Gallaudet College for the Deaf, receive a major portion of their funding from the government but are run as independent institutions). In all, there are 4,009 IHEs in the U.S.: 1,701 public and 2,308 private. They enrol a total of 14,367,520 students (86% of which are at the undergraduate level), and employ a total of approximately one million faculty members. The combined annual budgets of the IHEs is $183 billion. Aside from providing grants and guaranteed loans to needy students, the federal government spends $12.2 billion per year on research and development at universities. State governments provide a total of $52.5 billion in operating funds and student aid. Together, the IHEs award about 1.7 million undergraduate degrees and 518,000 graduate degrees each year.

The age of higher education students in the U.S. has changed dramatically over the years. Whereas the traditional age of 18- to 24-year-olds used to constitute almost the entire university population, it is now only slightly more than half. In 1995, the latest year for which statistics are available, 56.5% of the higher education students were 18- to 24-year-olds, 39.5% were 25- to 49-year-olds, and 4.1% were over 50 years old.

A kaleidoscope world: the pervasiveness of change

One of the forces driving the expansion of distance and virtual learning in the United States is change: change in pedagogical thinking, change in the communications infrastructure throughout the country, and change in the capacity and functionality of information and communications technologies (ICT). The pace of change is so great that it is almost impossible to get a stable picture that will be valid for any length of time.

In the first place, our understanding of the nature of learning and the relationship between the learner and the educational institution is changing. At the lower levels (elementary and secondary schools), the emphasis is on student-centred learning that is project-based and activity-oriented. It is based largely on the pedagogical theory of

the constructivists (i.e., that students must learn to construct new learning from disparate sources of information).

At the higher education level, the change is reflected in a more "customer-centred" approach that affects not only how students are treated as they interact with the institution, but also the very nature of the courses themselves. The courses are more practical, with content that the students can apply immediately in their jobs.

Second, the ICT infrastructure in the U.S. has expanded greatly, to the point where most households have a full range of telecommunications technologies. It is not unusual, for example, for middle-class households to have several television sets, cable television service, a couple of VCRs, one or more computers, two telephone lines, a cell phone, video games, and more. It is important to note that educational applications are not driving the increased accessibility of these technologies: commercial interests are. Educators are the beneficiaries of this expanded availability of the technologies.

Third, the technologies have much greater capacity and functionality. Cable systems regularly carry 130 channels of programming and are expanding to offer telephone and high-speed data access as well as television programmes. Computer storage of 8 to 10 gigabytes and processing speeds of 400 megahertz are now available at reasonable prices. Data travel through telephone lines at up to 53 kilobytes per second. And we in the United States are blessed with an affordable fixed-price telephone system so that we can use the Internet for an unlimited amount of time each month for one low monthly charge.

Furthermore, the technological differences among the media that once separated them from each other are quickly disappearing. The emergence of a single communications platform that supports the interoperability of technologies is no longer a dream. We live in the "age of convergence."

This expanded capacity of the technology has encouraged the development of new applications in education. For example, Real Video was developed to "stream" live television and radio programming, but what potential it holds for educational applications! Likewise, video-conferencing networks (such as the 400+ site Sprint Video Network) were developed to facilitate business meetings. But what potential they hold for remote site-based distance education!

All of these changes are converging to create a time of unprecedented opportunity for new ways of delivering and supporting educational opportunities. Virtual learning is a major beneficiary of the changes.

Growing commercial interest in education

In the United States, higher education, and especially distance education, has become big business, and that has attracted commercial interests. This trend is evident in many places. For example, New York University (NYU) is setting up a for-profit subsidiary to develop and offer distance education programmes. NYU hopes to generate enough revenues from distance education courses to subsidise some of its higher-cost on-campus courses. They believe that the numbers of potential students worldwide support this expectation. Through its Virtual College of the School of Continuing and Professional Education, NYU has begun to offer many online courses and degree programmes

NYU's perception of the growing market for distance education is shared by The Pennsylvania State University, which last year announced that it would establish World Campus to serve students worldwide. Perhaps adding fuel to the fire is the success being experienced by the University of Phoenix, a private virtual university that has seen its enrolment rise from 31,000 in 1992 to 48,000 in 1998 and a reported 61,000 in 1999.

The trend toward commercialism is further evident in advertisements that appear every week in *The Chronicle*. Hardly a week passes when Real Education (*www.realeducation.com*) does not have at least one full-page and several quarter-page ads welcoming new institutions that have contracted with the company to set up complete online degree programmes. The same issues of *The Chronicle* often feature ads from the Pangaea network ("the world's first online service wholly devoted to education and training"), which will develop "a virtual campus devoted to reaching and teaching unserved students locally, nationally, and internationally"(*www.pangaeanetwork.com*). As well, you are just as likely to see ads by Microsoft, Prentice-Hall, and other commercial interests.

Earlier in 1998, *The Chronicle* had an article describing how the Caliber Learning Network (*www.caliberlearning.com*), a joint venture of Sylvan Learning Systems and the telecommunications giant MCI Communications, was positioning itself to expand its teacher education and other professional development courses that are delivered nationwide by satellite, video-conferencing, and personal computer networks to learners located at their places of business and in shopping malls.

AT&T, the long distance telephone giant, has established the AT&T Learning Network, and through it has assembled a "virtual academy" (*www.tramline.com*) "to help address the growing need teachers have to access professional development opportunities in new ways." AT&T has tapped several institutions with distance education programmes to provide in-service professional development opportunities for teachers. The participating institutions include Western Governors University, Penn State's World Campus, George Washington University, Montana State University, and T.H.E. Institute. The "premier courses" that these institutions are providing help teachers meet two requirements: to effectively integrate technology in their classrooms, and to maintain their professional credentials with relevant and timely content.

These companies are just a few of the growing number of commercial companies that are tapping into what they see as a large and growing source of revenue: distance higher education and professional education. Others include IBM, with its e-business Solutions programme (*www.ibm.com/e-business*), Lotus (now a subsidiary of IBM), with its LearningSpace platform (*www.lotus.com/learningspace*), International Thompson Publishing's World Class Learning (*www.worldclasslearning.com*), and Embanet, a small Canadian company that is wooing U.S. institutions (*www.embanet.com*). A few are marketing isolated computer applications, but most are selling complete turnkey solutions in which they receive a continuing revenue stream from the tuition generated.

The Importance of Partnerships and Alliances

When information and communications technologies were first available to IHEs, and the Internet was a friendly, faculty-led environment, some began to explore ways of transferring some of their courses to this new medium. At first, it seemed simple, quick, and inexpensive. However, as those institutions gained experience with the process, they began to realise that if they were to serve students well, it was not sufficient to create "shovelware" courses (i.e., old class notes just shovelled into an electronic format). They began to apply instructional design principles to the process, and the cost and timelines began to grow.

Soon, the institutions realised that if they were to use the power of the new technologies to their fullest, they could not do it alone. It made sense to partner with other like-minded institutions and commercial companies that had skills that the IHEs lacked. Thus, new alliances of institutions

and companies began to emerge. Some are direct alliances, with universities joining together to develop and offer a new degree programme. Others are third-party alliances, such as the 180 institutions that co-operatively offer degrees through the Public Broadcasting Service/Adult Learning Service's *Going the Distance* programme (*www.pbs.org/adultlearning*).

A New Paradigm for Virtual Learning

As IHEs became more experienced at offering virtual courses, some realised that the new delivery platforms demanded a new paradigm of learning. It was no longer feasible to use the "sage on the stage" paradigm of traditional education. The learners needed to play a much more active role and they needed wide flexibility in when and how they accessed faculty members, other students, and instructional resources. The role of the faculty member had to change. The types and quality of instructional resources that support learning had to move beyond the traditional textbook model.

Many institutions have tried various new approaches. One paradigm that holds great promise is "The Four Conversations," which places a strong emphasis on the dialogic nature of learning. It maintains that all learning consists of four types of dialogue:

1. The "conversations" a learner has with an instructor
2. The "conversations" among groups of learners
3. The "conversations" a learner has with instructional resources
4. The "conversations" a learner has with himself or herself (i.e., reflection)

The challenge for communications-based distance and virtual education programmes is to make appropriate use of communications technologies to support each of the four dialogues.

Focus on a Whole Systems Approach

In recent years, IHEs have begun to devote as much attention to student support services as to the course materials—online support services such as course and programme information, registration, access to library resources, ordering from a bookstore, access to financial aid information, easily accessible counselling service, and other non-academic services normally available to on-campus learners. These efforts have been partly fuelled by federal government programmes, especially the Fund for the Improvement of Postsecondary Education (FIPSE) (*www.ed.gov/offices/OPE/FIPSE*). Some private foundations have also been supporters. The idea behind these efforts is that the distance learners are not second-class enrolees; they should have all the services of the institution made as easily available as the course materials themselves.

"Unbundling" the Educational Process

Until recently, the university was a self-contained society. Faculty members developed courses and course materials, offered those courses, and assessed student performance. The university provided pre-enrolment, enrolment, financial aid, record-keeping, and transcription services. It also provided instructional support services such as a library, computer labs, bookstore, and student union, complete with clubhouses, dining rooms and restaurants, and meeting places. Many provided complete housing services.

More recently, universities have begun to examine this process and ask which are the "core" functions that must be performed by the university and which functions might be more efficiently "outsourced" to other organisations or companies. For example, many, if not most, universities

today contract with food-service companies to operate the dining rooms and restaurants on campus. Others are turning their bookstore operations over to commercial companies. Some are contracting out the maintenance of campus facilities.

All of the outsourcing to date has been in the business and administrative area, but now some universities are considering unbundling student support services such as counselling and financial aid. A few are even examining the feasibility of unbundling some of the core instructional services, such as assessment (especially a few universities that are working closely with employers to develop tailored degree programmes).

Other driving forces behind virtual learning

Other forces driving the development of virtual learning in the U.S. include the following:

- *Available and affordable hardware:* Increasingly, Americans are acquiring telecommunications technologies and services to use in all aspects of life.
- *User-friendly software:* Most software is now much easier to use, making access to the technology much easier.
- *An evolving vision of the possible:* Until recently, it was difficult to imagine how disparate technologies could be brought together into a single-delivery system and even more difficult to imagine the changes that had to be made in course materials and student support services. Now, as more and more educators exchange their experiences, some shared visions are beginning to emerge.
- *Affluence:* The strong economy of the past several years has meant that individuals have more disposable income to spend on education and the technological infrastructure needed to obtain it at a distance. It also means that educational institutions have more resources (from increased tax revenues and tuition fees) to put into programme and course development.
- *Learner mobility:* It is not uncommon for 20% of the U.S. population to move every year for job-related reasons. This has made it difficult for learners to complete degrees at a single institution. It has also led many colleges and universities to seek ways to serve their learners at a distance.
- *Skilled and trained course developers:* More colleges and universities are hiring staff in new positions to support technology-assisted instruction. These individuals often bring new skills and perspectives to the institution, especially new ideas on course development, the creation of learning materials, and delivery means.
- *Improved course development/management software:* Until recently, when a faculty member wanted to offer a distance education course, he or she had to develop it completely from scratch, often without much help. The burden on the faculty member was great, and the burnout rate was high. Now, there are many affordable and easy-to-use software packages that relieve many of the burdens of developing and offering courses online (e.g., First Class, Top Class, WebCT).
- *An attitude of customer service:* As colleges and universities have had to compete to attract students to their programmes, they have begun to adopt some of the business practices of successful companies. Many colleges and universities are now instituting "one-stop service centres," where students can have all their questions answered and conduct all their transactions with the university.
- *"Just-in-time" thinking:* This is another cue that colleges and universities are taking from the business world. In the past, many businesses

used to build large inventories of their goods in order to keep their factories operating at a high level. Today, businesses tend to produce only what is needed to meet the immediate demand. This practice reduces costs of production, warehousing, and distribution. Colleges and universities are emulating this practice by creating and offering only those courses they need to meet the immediate demand. And, if they create and produce their own course materials, they are producing them in just the numbers they need to serve the students they anticipate in the immediate future.

- *Entrepreneurial spirit:* Perhaps one of the most important forces driving the development of distance education and virtual learning is the spirit of entrepreneurship that is in the hearts of many of the leaders of the field. In some cases, this is demanded by the institutions, which often require distance education programmes to be self-supporting. Only an entrepreneur with a strong sense of business could know how to assess the needs of the marketplace, develop products (courses and programmes) to meet those needs, deliver them conveniently, support them with solid service, and price them appropriately.

The growing interest in virtual learning has spawned the development of a new monthly online journal, the *Virtual University Gazette* (*www.geteducated.com/vugaz.htm*) that tracks new programmes not only at universities but also those offered by the professions and business and industry. The *Gazette* is published by Vicky Phillips, CEO of Lifelong Learning (Waterbury, VT), a distance learning consulting firm.

Phillips has also co-authored, with Cindy Yager, *The Best Distance Learning Graduate Schools*, a 322-page publication that profiles 195 accredited graduate schools that offer complete degrees at a distance. Published by *The Princeton Review* and Random House Publishers (*www.randomhouse.com*), the 1999 edition has several chapters of advice for the reader on topics such as what to look for in distance education programmes, how to select among delivery technologies, and how to seek financial aid to pay for the degree.

Virtual University Degree Programmes

By law and tradition, education in the United States has been a local and state responsibility. That is one reason why the U.S. has not had a nationwide institution equivalent to the Open University in the U.K. Although U.S. universities have for years drawn students from all over the country, their programmes have been perceived as local, not national. Each institution is licensed in the state in which it operates and is accredited by a regional accreditation association. It is only in recent years, as institutions have begun to introduce distance education programmes that do not honour traditional institutional boundaries (or even political boundaries), that this system of licensing and accreditation has been challenged.

A recent study by the Western Cooperative for Educational Communications (WCET), a programme of the Western Interstate Commission for Higher Education (WICHE) (*www.wiche.edu*) documented the extent to which 1,400 of the nation's 3,000 colleges and universities offer distance education courses and programmes. The study found that 79% of all the institutions offer one or more distance education courses (broadly defined to include correspondence courses, telecourses, Web-based courses, site-to-site videoconferencing, and other delivery modes), and one-third offer one or more complete degree programmes at a distance. Those data are consistent with the findings of other recent studies.

Most of those institutions offering complete distance education programmes do so as an extension of their campus-based programmes, which continue to dominate their mission. Only a few U.S. IHEs, such as National Technological University, Western Governors University, and the University of Phoenix, can be considered "virtual universities" in the sense that other countries have such institutions.

Interest in virtual learning at the university level is so great that many traditional universities are rushing to create Web-based courses just so that they can say they are offering virtual learning opportunities. Some of the virtual degree programmes listed below are offered by "virtual universities," while others are offered by "dual-mode" institutions.

Regents College

Regents College of New York State (*www.regents.edu*) bills itself as "America's First Virtual University." It is an unusual institution in that it does not itself offer courses of study, but rather certifies what the student has learned from other sources. They put it this way:

> We believe that what a person knows is more important than how or where that knowledge was gained. Since 1971, we have been providing adult learners the means to demonstrate and validate the learning they have achieved, whether by traditional college classroom study, college-level proficiency examinations, or evaluated military and industry training.

Regents grants its credits and degrees by evaluating the student's prior learning, offering exams for various courses, and "banking" credit earned through various other pathways. They currently offer 30 associate and bachelor's degrees in Business, Liberal Arts, Nursing, and Technology. A master's in Liberal Studies has just been added.

A large portion of the Regents College student body is comprised of members of the U.S. military community. Because military personnel are transferred often, they often find it difficult to pursue college degrees. Regents overcomes that barrier by recognising credit earned at any U.S. regionally accredited IHE as well as training courses sponsored by the Department of Defense, other government agencies, and business and industry. Credit award is based on the recommendations of the American Council of Education (ACE), and the college awards over 50,000 college credits annually for military experience alone. Since 1971, over 79,000 adult learners have earned Regents College degrees, and more than 33,000 of those (42%) are military service members.

Regents College currently enrols approximately 17,400 students per year. About 11,000 of them are pursuing Nursing degrees (making Regents the largest Nursing programme in the United States); 4,000 are in Liberal Arts; 1,300 are in Business, and 1,100 are in Technology.

Regents offers a wide range of support services for its students. Its Electronic Peer Network supports discussion groups, chat rooms, and a student directory. In development are a book exchange, message board, and a distance learning centre (which will contain student ratings of distance courses and examinations taken from U.S. colleges and universities).

In recent years, Regents College has greatly expanded the availability of its course examinations by partnering with Sylvan Technology Centers. Through those Centers, Regents College exams are available six days per week throughout the United States and in Canada, American Samoa, Guam, Puerto Rico, Saipan (Northern Mariana Island), and the Virgin Islands. The college has also partnered with Specialty Books, one of the nation's leading collegiate bookstore operators, to provide its students with access to almost 600,000 course books and computer software that can be ordered by phone toll free, with shipment promised within 24 hours.

Regents College is sensitive to the fact that most of its students are working people with limited resources. Accordingly, they try to keep their costs low. The current fee for evaluating a potential student's prior learning portfolio is $150, half of which can be credited towards enrolment fees.

National Technological University

National Technological University (NTU) (*www.ntu.edu*) is a freestanding virtual university that evolved over a decade from projects designed to provide continuing education for engineers. Engineering schools that were members of the American Association for Multimedia Continuing Education for Engineers (AAMCEE) would videotape on-campus courses taught by their faculty members and make those courses available to engineers at their work place. They would contract with employers who would pay their engineers' tuition plus a premium so that the engineers did not have to leave work to take the courses. Over time, some of the participating institutions developed microwave systems to deliver their courses to engineering companies in their regions. Eventually, NTU was formed to deliver those courses nationwide by satellite. Since its formation, NTU expanded its horizons beyond the engineering profession and now offers courses in engineering, business, and nursing.

Today, National Technological University is a co-operative effort of 50 major universities providing graduate and continuing education for today's busy professionals and managers. The member universities are linked by satellite telecommunication and compressed digital video technology to more than 1,000 work locations internationally, and by interconnections to other regional networks to another 350 sites in North America. There is no resident campus. There is a one-time fee for access to the NTU Network, which does not include the tuition and registration fees for courses taken at the site.

In 1996–97, professional workers were able to choose from more than 500 academic courses providing 22,000 hours of instruction, plus another 500 days or 3,000 hours of continuing education. In that same year, 1,300 working professionals and managers were admitted to NTU degree programmes. Continuing education enrolment exceeded 110,000.

NTU offers 14 master's degree programmes designed specifically for technical professionals. It does not award bachelor's or doctoral degrees.

University of Phoenix

The University of Phoenix (*www.uophx.edu*) is a private virtual university that has been accredited since 1978. It was one of the first universities to recognise the need for targeted degree and continuing education programmes for adults.

Today, with over 61,000 students, the University of Phoenix promotes itself as the largest private accredited university for working adults. It has provided degree and certificate programmes to more than 371,000 people in the United States, Puerto Rico, and elsewhere.

The cornerstone of the University of Phoenix's educational philosophy is the recognition of the distinction between the younger student (still deciding on a career) and the adult student (who has already established personal and professional goals). They have developed academic programmes that allow mature students to benefit from the integration of work and school. Most of the university's faculty members are working practitioners, experts in their field.

The University of Phoenix offers graduate and undergraduate degree programmes and certificate programmes, many of them online. It has structured its courses so that students take one course each five to eight weeks because research shows that adults learn best in an atmosphere of concentrated immersion. The programme runs

throughout the calendar year, allowing students to start anytime at their convenience. Courses are offered on-site at University of Phoenix learning centres situated in 14 states, several foreign countries, as well as through the World Wide Web.

Western Governors University

The Western Governors University (WGU) (*www.wgu.edu*) is a new, student-centred university (it accepted its first students in the fall of 1998) founded on the principles of distance and virtual learning. It brokers and offers courses from dozens of colleges, universities, and corporations from all over the world. It delivers the courses using both high-tech and low-tech approaches, from Internet to satellite to "snail mail." The university uses a competency-based approach to education that allows the learner to build a portfolio of skills already learned and take only those courses needed to complete a degree. The student chooses courses from the university's SmartCatalog, a directory of programmes, advising services, and resources available. An online library containing more than 60 full-text databases is included.

The initiative to create Western Governors University came from the governors of 13 states who recognised that they could not individually afford to provide sufficient continuing education opportunities to adults in their states. So they pooled their resources to create a single, region-wide institution. The administration chose not to develop and operate all the subsystems of the university within the university itself. One of the first steps they took in creating the university was to solicit proposals for the development of the SmartCatalog, the library, and the university bookstore. They were among the forerunners in implementing the idea of "unbundling" and outsourcing selected university functions. WGU even outsources its instructional programme, with courses being provided by about two dozen "education providers."

The academic programme of Western Governors University is young and expanding. Currently it consists of an Associate of Applied Science in Electronic Manufacturing Technology and an Associate of Arts degree, as well as many individual courses taught by faculty members and professionals at institutions and corporations that are participants in WGU.

In the first two weeks after the WGU opened its Web site, 75 people applied for admission, despite the university's projection that up to 5,000 students would enrol in its first year. University officials said computer glitches were partly to blame and they also noted that they had already filled thousands of requests for information by mail prior to the initiation of the Web site. It should be noted that the university did not have a very effective campaign promoting the opening of its Web site for enrolment. It might take some time before the university's name is firmly embedded in the various search engines that learners use to find such opportunities.

California Virtual University

California is the only western state that chose not to participate in the Western Governors University. California policy makers believed that they had enough of a critical mass in that state alone to warrant the establishment of different arrangements for distance and virtual education. They chose, instead, to establish the California Virtual University (CVU). Like the Western Governors University, it was planned to be largely a broker of instruction and student support services. The university's literature stated plainly that "the California Virtual University does not grant degrees or certificates, or answer individual questions about courses." Rather, the university intended to help learners further their educational goals by linking them to online courses and other services offered by the state's colleges and universities. Through the university's Web site (*www.california.edu*), you can find out

about courses and certificate or degree programmes offered at a distance by California's IHEs and be linked to a campus to enrol or find more information.

The institutional response to the California Virtual University idea by the IHEs in the state was swift and strong. When it was launched in the beginning of 1998, 65 public and private accredited colleges and universities were listed in the university catalogue, offering about 800 distance education courses. Six months later, the participation had grown to 95 institutions offering about 1,600 courses. Ultimately, 240 colleges and universities were expected to participate in CVU within three years.

Like the WGU, the California Virtual University had strong support from the state's governor (since voted out of office). Also like the WGU, CVU planned to "unbundle" the traditional functions of the university. Not only would it rely entirely on its participating institutions for the instructional component, it also turned the operation of its Web catalogue of online courses to a non-profit foundation that was formed by educators. In effect, the California Virtual University Foundation, which includes the state's main university systems (University of California, California State University, and California Community College organisation) and several corporations, such as Sun, Cisco Systems, Pacific Bell, Oracle, and International Thomson Publishing, would operate CVU as an independent institution. Each of the corporate partners contributed $75,000 to CVU's start-up costs. The university also received a $250,000 grant for its launch from the Sloan Foundation.

In spite of the early enthusiasm for CVU, it encountered an unexpected hurdle. The three participating university systems balked at funding CVU at a rate of $1 million each for three years. The funding shortfall resulted in CVU ceasing operations as an independent organisation only eight months after being spun off from the state government. CVU will, however, retain a presence on the Internet. The California Board of Regents agreed to maintain CVU's Web site, which lists available courses from more than 100 participating institutions. The ultimate fate of CVU remains to be seen.

Concord University School of Law

Concord University School of Law (*www.concord.kaplan.edu*) is a new institution established by Kaplan Educational Centers in October 1998 to offer a juris doctorate degree wholly online via state-of-the-art technology. The target learners are working students, professionals, family caretakers, learners in rural communities, and others whose circumstances prevent them from pursuing a legal education at traditional institutions. The degree is a four-year graduate programme.

Students view lectures on the Internet at their own convenience 24 hours a day, 7 days a week. The lectures are presented using streaming technology. Students have online access to a law library to complete their assignments and fulfil curriculum requirements, including case studies, legal arguments, and statutory codes. They also take interactive exams online.

In establishing Concord University, Kaplan, a subsidiary of *The Washington Post*, is building on its years of expertise in offering LSAT preparation classes that help students succeed in law school. The university will complement Kaplan's 1,200 study centres in the U.S. and abroad, where it offers test preparation, training, and career fairs.

Colorado: A Hotbed of Distance and Virtual Learning

For some reason, the state of Colorado seems to have nurtured more distance and virtual learning programmes than almost any other part of the United States. It is the birthplace of the Western Governors University. It also is home to

Colorado State University, where the National Technological University was born. It has seen the creation of Mind Extension University (now Knowledge Online), the College Connection, and the International University by Jones Intercable Company. It boasts the Colorado Community College Online, and a host of other distance and virtual learning programmes such as the Colorado State University Master's in Business Administration.

- *The Colorado State University MBA* (*www.biz.colstate.edu/mba*) can be earned in two or four years. Students are sent a videotape of each class once a week, which can be viewed at home, according to each student's schedule. Professors assign projects, which must be completed within a specified time. Much of the coursework is completed using the Internet.

  Interaction with the faculty and other classmates can occur via Internet, fax, or telephone. Each student in the programme is required to have access to a computer and to the Internet.

- *Colorado Community College Online* (*www.ccconline.org*) is composed of the 13 colleges in the Colorado Community College and Occupational Education System (CCCOES). Through CCC Online, students can earn fully accredited Associate of Applied Science degrees and certificates in various disciplines (Business, Occupational Safety, Emergency Management and Planning). CCC Online enhances instructional services to students by offering online communication with faculty and fellow students who may be anywhere in the world.

  Students may take courses "anytime anywhere" at their convenience. CCCOES colleges have standing transfer agreements with most of the four-year public and private colleges in Colorado. In addition, there are transfer agreements with colleges both in-state and out-of-state that offer bachelor's completion programmes also using distance/electronic technology. Among these are Regis University, Governor's State University, and International University.

- *Jones International University (JIU)* (*www.jonesinternational.edu*), a for-profit institution with an emphasis on educating the workforce, has made quiet but meteoric progress in becoming recognised as a legitimate provider of distance and virtual education. It became the first virtual university in the United States to be fully accredited by a regional accreditation agency.

  JIU began offering courses in 1995. Its offerings include two degree programmes in business communications (a master's and a bachelor's) plus a number of certificate programmes. Courses are aimed at working adults who have attended college but have not completed a degree.

  The reaction to JIU's accreditation was swift, with the American Association of University Professors (AAUP) lodging a protest with the North Central Association of Colleges and Schools. In the AAUP's view, JIU must be providing inferior education since most of its faculty are adjunct, the university's courses are not offered on traditional academic schedules, the university lacks traditional resources such as a library (it operates an electronic library with an on-call librarian) and research laboratories, and many of its students (about 90%) do not seek complete degrees. The accrediting association stood behind its decision, noting that JIU meets the association's standard requirements in non-traditional ways.

University of Maine System: UNET

The University of Maine formed its Network for Education and Technology Services (UNET) (*www.unet.maine.edu*) in 1997 by merging what had been the Education Network of Maine with the system's computing and data processing services. UNET provides distance learning and student support services to learners throughout the state. The system has built a statewide network of learning sites, most located on university campuses or in high school buildings.

Through UNET, students can pursue a variety of associate, bachelor's, and master's degree programmes, as well as certificate programmes. Most of the courses are site-based, although some have been converted to Web-based courses that are offered through the WebCT software application.

Private virtual degree programmes on the drawing board

The rapid growth of interest in distance education and its apparent acceptance by a growing segment of the higher education community has led to the emergence of several new, private, for-profit virtual universities that are in various stages of becoming accredited universities.

- *Magellan University* (*www.magellan.edu*) was established a couple of years ago and now claims to offer 70 courses. Their online catalogue lists 14 short courses in advanced mathematics, 6 courses leading to Microsoft Certified Systems Engineer (MCSE) certification, and over 50 "flexible-length" courses in desktop software training (e.g., Microsoft Word, PowerPoint, Excel). College credit is currently available only for the MCSE courses through a partnership with Pima Community College, in Tucson, Arizona. The university has been in the process of developing its own degree programmes for some time.
- *Athena University* (*www.athena.edu*) is administered by VOU Services International. Virtual Online University (VOU) was established in 1994 and has been offering online teaching since the World Wide Web was privatised. In 1997 it was reorganised and reincorporated into VOU Services International to reflect its consultations and collaborations with colleges and universities worldwide. With offices located in Columbia, Missouri, VOUSI has established collaborations with institutions in China, Europe, Africa, and the Middle East.

  Athena University is a non-profit institution founded to provide high-quality educational opportunities on the Internet as inexpensively as possible. (Tuition is currently only $100 per credit hour.) Its focus is on providing an integrated, interdisciplinary curriculum in the liberal arts. It provides bachelor's degrees in History, Languages, Math, Science and Computers, and a master's in Business Administration. It is not clear from the literature whether Athena University is an accredited institution.

Virtual School Programmes (K–12)

For the past century and a half, the United States has built a system of elementary and secondary education (K–12) based on the principle of local and state control of schools. The federal role in education is minimal, and the federal contribution to elementary and secondary education is less than 10% of the total cost. Consequently, the United States does not have a tradition of national schools, but that might change because of the availability of information and communications technologies and the impact they are having on education.

Nevertheless, there is a need for some instructional services that might be shared by local schools, services that are too expensive for schools to afford individually. There is also a need for teacher training that cuts across traditional school district boundaries. The latter need has been magnified by the recent adoption of new academic standards in most subject areas, necessitating in-service education for all current school teachers and new formation programmes for pre-service teachers.

Home schooling, a fast-growing phenomenon in the U.S., has created an additional market for companies that are providing or contemplating the development of K–12 instructional programmes that take advantage of information and communications technologies.

The virtual learning programmes chosen as examples in this section are considered to be leading edge because of the infrastructure they are putting in place or the potential impact they will have on the way elementary and secondary education is offered in the 21st century.

The Star Schools Project

Two of the main roles the U.S. federal government plays in education are to encourage equity in educational opportunity and to stimulate advances in educational practices. The Star Schools Project (*www.ed.gov/prog_info/StarSchools*) was instituted to contribute to both areas. It was noted that many rural and poor schools could not afford to hire and retain qualified teachers in mathematics, the physical sciences, and foreign languages at the high school level, so the U.S. Department of Education instituted the Star Schools Project in 1988. It funds multi-year projects that use ICT to bring outstanding teachers of those subjects to schools that had previously been unable to offer such courses to their students.

It is estimated that in one year, the Star Schools Project serves more than 1.5 million students in all 50 states. In recent years, Star Schools projects have included instructional modules, video field trips, enrichment activities and semester-long and year-long courses. Through Star Schools, students can question astronauts about the principles of physics. Japanese- and German-language students can talk with native speakers and visit Japan and Germany through live and interactive teleconferences. For most students served, distance learning is their only access to science, math, foreign language, and advanced placement courses.

The Universal Service Fund

In passing the Telecommunications Act of 1996, the U.S. Congress mandated that a portion of all telephone bills should be set aside to fund the development of telecommunications infrastructure and services in the nation's elementary and secondary schools and public libraries. While the regulations have taken some time to approve to implement this Act, the principles of the Universal Service Fund (*www.ed.gov/Technology/eratefacts.html*) are worth noting for their potential impact on virtual learning throughout the country (and, perhaps, the world).

The fund was created to make telecommunications services affordable for every school and library. A school or library will receive discounts of 20% to 90% (the exact amount depends on the number of disadvantaged students in a school or community) on telecommunications services, internal connections, and Internet access. Discounts are applied to the full price, and the school or library will pay for the remainaing portion. The portion paid from the programme fund will go directly to the service provider.

Universal Service Fund discounts can be applied to a school's or library's internal connections, telecommunications services, and Internet access. Although the fund will not pay for desktop computers, learning software, or teacher/librarian training, schools and libraries can use the funds they save on telecommunications infrastructure

to support these elements of a comprehensive technology plan.

One benefit of the fund that is already being realised is that it has forced schools and school districts to develop long-term technology plans.

Florida High School and the Florida Distant Learning Network

In 1996, the Orange County (Florida) Public Schools introduced an experimental WebSchool that offered online courses, SAT preparation, and computer programming, to Orange County students. Just as Orange County was venturing into cyberspace, Alachua County (also Florida) was also proposing an online school to span the state. Thus, from collaboration between the two counties, The Florida High School (*www.fhs.net*) officially began in August 1997 as a joint project, with 15 educators serving in administrative, instructional, and developmental jobs.

The project's mission is to place a complete high school online by the year 2001, which will include those courses and services to enable students to make a successful transition to post-secondary educational institutions and to the work place. To maintain high quality, course content will meet the requirements of the Florida Sunshine State Standards as well as important criteria such as the SCANS competencies that are supported by both the education and business communities.

Florida High School's first students enrolled for courses that began in January 1999.

The state of Florida has also created the Florida Distant Learning Network (FDLN) (*www.firn.edu/fdln*) to assure its citizens access to advanced telecommunications services that will complement the provision of educational and health care services. The idea behind the legislation establishing FDLN was to establish a co-ordinated system for cost-efficient advanced telecommunication services and distance education.

California Distant Learning Program

The California Distant Learning Program (CDLP) (*www.rscs.rssd.k12.ca.us*) probably comes the closest to virtual learning programmes of other countries at the elementary and secondary level. This is the first K–8 online distance learning programme to appear in California, and it is perhaps the only complete programme in the U.S. at this point. The Ready Springs Charter School in Penn Valley, California is offering this innovative learning option for elementary-age students. Students and parents who choose this programme will find three curricula online, allowing for choice in education.

CDLP seeks to recognise the unique interests and learning styles of each student, offering options to design a specific plan for each child that is age-, interest-, and academically appropriate. The curricula include Natural Learning Rhythms, a holistic curriculum offering age-appropriate teaching techniques; a multi-sensory curriculum based on hands-on learning activities; and a traditional academic curriculum suggesting skills a student should address or master at each grade level. Parents, students, and a CDLP resource teacher co-ordinate and co-create a course of study based on each student's interests and skills level.

CDLP is part of the public school system. Any parent who is a resident of California may enrol their child with the CDLP if they are not enrolled in another public school.

Cable in the Classroom

In 1989, the cable industry established Cable in the Classroom (CIC) as a public service to schools throughout the United States. The idea behind the programme (*www.ciconline.org/home.htm*) is to place in the hands of teachers instructional resources that take advantage of the power of the technologies to enhance teaching and learning.

Two types of cable entities join forces to support Cable in the Classroom: cable system operators (such as TCI, Time Warner, MediaOne, and Cablevision), and cable programme networks (such as Arts & Entertainment, CNN, Discovery, and ESPN). The cable system operators have committed to provide every school passed by their systems with a free cable connection and free basic cable service each month. Consequently, more than 80,000 of the nation's 90,000 elementary and secondary schools have a cable connection. The cable programme networks have committed to provide more than 500 hours of programming each month, programming that is educational, free of charge, commercial-free, and cleared for recording and retention by teachers for at least one year. Through CIC, the cable industry has also trained more than 7,500 teachers each year for the past 10 to use these technologies effectively in their classes.

While not a virtual learning institution in itself, CIC provides teachers throughout the U.S. with vast multimedia resources that can be used in distance and virtual learning. The resources cover most subjects and all grade levels. For example, Nickelodeon offers programming and support materials for young children, and the Arts & Entertainment channel (A&E) offers, among other things, biographies that are appropriate for use in high school courses. Some of the programme networks, such as Discovery, have gone to great lengths to correlate their broadcast programmes to the new academic standards and have placed those correlations and extensive curriculum materials on their Web sites. The CIC Web site is a "gateway" to the sites of all the cable programme networks.

As cable companies gear up to offer Internet service through high-speed cable modems, they have extended their commitment to education to include one free cable modem to each school that is passed by the new service. They also have funded the expansion of CIC's training programme to create the CIC Professional Development Institute which will, starting in 1999, train between 50,000 and 75,000 teachers each year to integrate not only video technologies but also the Internet and World Wide Web effectively into their classes.

University of Pennsylvania High School to College Program

The University of Pennsylvania has teamed up with the Sylvan Learning Corporation to offer high school students a distance education opportunity to experience a university-level course while at the same time earning university credit. Through the PennAdvance Program of its College of General Studies, the University of Pennsylvania (*www.advance.upenn.edu*) invites high school students "to discover what it's like to take a real Penn course and earn a Penn transcript." Courses are offered in Calculus for the Natural Sciences, Introduction to Psychology, and Introductory Micro Economics.

PennAdvance courses are delivered in collaboration with the Sylvan Academy (and its Caliber Learning Network) (*www.sylvanlearning.com*) and are taught with a combination of advanced technologies that create powerful learning experiences for every student. The courses use a combination of broadcast delivery and Web-based support allowing students to receive an Ivy League learning experience in various cities across the country—without requiring the students to travel to the university in Philadelphia.

A live broadcast is delivered to students weekly at a Caliber Learning Center in their neighbourhood. Instructors and students interact live through Caliber's combination of satellite broadcasting, two-way video-conferencing, and computer networking. In between the weekly broadcasts, the course Web site extends the learning experience. Using live chat, e-mail, and threaded discussions, the Web site functions as a communications center. Each student can get the help he

or she needs from the instructors and from fellow students. Homework and quizzes are submitted online for instant grading, and the entire course syllabus, lecture notes, practice problems, and reference materials are available to the student through the Web site.

Virtual Professional Development Programmes

Often, virtual learning programmes are offered outside the framework of the traditional education system, both at the elementary/secondary and the higher education levels. Some of the programmes listed below are offered by professional associations, others by traditional universities. Some are tied in with professional licensing certification, others are not.

Engineering Education

In addition to the National Technological University described above, several traditional U.S. universities use information and communications technologies to extend their traditional engineering degree programmes to engineers located anywhere in the U.S. or beyond. Columbia University, for example, has established the Columbia Video Network (CVN) for precisely that purpose (*www.cvn.columbia.edu*).

Established in 1986 to meet a growing need for flexible graduate engineering education delivered to the working professional, CVN promises its virtual students the same benefits and privileges of a Columbia Education enjoyed by on-campus students. Virtual learners (Columbia calls them "off-campus students") enrol in Columbia courses taught by Columbia University professors, have full access to Columbia University faculty, and the same Columbia University degree as on-campus students. CVN delivers course lectures to off-campus students by videotape or through video-conferencing, while course materials and syllabi can be easily accessed on the World Wide Web. Degree programmes are offered in Computer Science, Electrical Engineering, Mechanical Engineering, Engineering Management Systems, and Materials Science.

Teacher Education

Columbia University, through its Teachers College, offers a virtual certificate programme in teacher education (*www.tc.columbia.edu/~academic/ceoi/distlearn.htm*) in instructional design and computer mediated instruction. The online courses are rich in human interaction and include collaborative projects. Students may take them at the time and place of their choosing within broad time parameters set by the university. They are not required to travel to the Teachers College campus but Web access is required. The courses may be taken for three credits or for non-credit. Course fees are $610 per credit or $495 for the entire non-credit course.

The courses are delivered through software that enables group collaboration, allowing students to contribute at home, at work or while travelling, at any time or place of their choosing. Discussions are text-based and unfold over the course of hours or days. Students have the opportunity to converse and work with classmates whose geographical locations may span regional and possibly national borders.

In California, there is a major effort under way to provide basic credential classes to the many elementary school teachers who are being hired without credentials. The California State University System has developed the Distributed Learning Network in conjunction with Simon Schuster Publishing, KCET public television station, and Los Angeles County classroom teachers to create video course modules in reading methods, mainstreaming of special education students, classroom management, educational technology, and cross-cultural language and academic development strategies. Those courses are aired statewide and are supplemented with e-mail,

telephone conferences, and dedicated Web pages for each course.

Health services education

A young and still-developing service for health care providers is Continuing Education for Health-Care Providers (CEHP) Online. Currently limited largely to the dental profession, CEHP Online contracts with prominent authors to create online courses on professional topics in dentistry. CEHP Online allows professionals to attend courses in the privacy of their offices or homes, 24 hours a day from anywhere with just a computer and a telephone line. It encourages them to become part of a global professional community.

Virtual Training Programmes

In the past, most businesses would have turned to universities and community colleges to train their employees. Today, however, many businesses are setting up their own training programmes and even complete institutions. The focus of these efforts is often the development of training that is more focused and immediately practical than the courses IHEs are interested in providing.

Not all business training programmes provide virtual learning opportunities. However, since many businesses in this day of global commerce have operations scattered throughout the world, many are turning to distance and virtual learning to continually upgrade the skills of their scattered workforce and to educate their customers about the benefits of new products as they are introduced. Consequently, corporate training programmes range from internal staff development to wide-scale customer education. A few exemplary programmes provide some sense of the vast range of training applications.

Workforce training

It is difficult to grasp the extent to which businesses are using distance and virtual education methods to train today's workforce. All businesses are feeling the need to provide more training than ever before. Shorter product cycles and a rapidly expanding knowledge base has put tremendous pressure on businesses to upgrade the skills of their workers in a timely, effective, and economical manner. The American Society of Training and Development (ASTD) estimates that in the next 10 years, 74% of today's workers will need retraining. Those numbers, plus the fact that many workers cannot afford to interrupt their careers for full-time study in traditional settings, have forced corporations to explore new forms of workforce training. In some cases, the scope of the challenge is enormous.

Many companies have begun to use the information and communications technologies to deliver training in those same technologies at a distance. It is now possible, for example, to take complete certificate training programmes online and to become certified as a Microsoft Engineer or a Novel Network Administrator.

- *The Ford Motor Company* recently received an award from One Touch Systems for training a total of 405,980 worker-students in 1997. *The U.S. Social Security Administration*, which operates the largest and busiest interactive video training network in the federal government, received an award for the most participants in one class—1,408 students. *JC Penney Company* was cited for having the most student interactions in one class. These are three large organisations that are regularly using information and communications technologies to train vast numbers of their workforce.
- *DigitalThink* (*www.digitalthink.com*) is a new, privately financed company (founded in San Francisco, California in March 1996) that promotes itself as a Web-based trainer. Its courses create an online community of students, tutors, and instructors in classes that

are "more interactive than textbooks and much more convenient than brick-and-mortar, fixed-time classroom instruction."

DigitalThink contracts with best-selling authors and topic experts to create original content for Web-based courses. In addition to the role played by the instructors, tutors answer e-mail messages and engage in threaded discussions and chat sessions with the students. DigitalThink sells Web-based courses directly from its Web site to corporate training departments. Course prices currently range from $125 to $450 per student.

DigitalThink's training courses are offered for continuing education units (CEUs), which are convertible to college credit under an arrangement with the University of Phoenix (see the Virtual University Degree Programmes section above).

- *Dowling Institute* (*www.dowling.edu*), located in New York, offers a suite of Microsoft Office training programmes via e-mail and online. It has served students from all over the world. Each course consists of 15 or 16 lessons and costs $60.
- *QuickStart Technologies* (*www.quickstart.com/etraining*) provides online access to the tools and study materials necessary to prepare for Microsoft certification exams. Those resources can also be used to just brush up on product knowledge. The courses are highly affordable at a cost of $199 per student for unlimited 90-day access to the virtual campus.
- *Wang Global Virtual University* now provides Internet training and mentoring programmes to its workforce of over 2,500 Microsoft Certified Professionals through Scholars.com (*www.scholars.com*) and will be providing technical training to its 15,000 technical consultants worldwide through the same platform.

Many other companies are making similar uses of information and communications technologies to train their workforce and to introduce their products to customers.

The Public Broadcasting Service

Since 1981, the Public Broadcasting Service (PBS) has worked with colleges and universities throughout the United States to deliver video-based college-level courses. For many years, the courses were offered on an ad hoc basis and lacked the cohesiveness of a complete degree curriculum. (There were not enough high-quality, broadcast-ready courses to provide a complete degree programme. Upper division courses were especially lacking.) To address that limitation, in 1994 PBS instituted the Going The Distance project (*www.pbs.org/adultlearning/als/gtd*). The purpose of the project is to assist colleges and universities in developing complete degree programmes using tele-courses and other media-based courses (many of which are distributed by PBS). The ultimate goal is to offer a virtual campus to every college in the U.S. So far, 180 IHEs in 38 states are participating in the project, and 70 public television stations air many of the video-based courses.

In 1996, PBS, seeing another need and an opportunity, established The Business Channel (*www.pbstbc.com*). It offers a wide variety of workshops and short courses that it markets to businesses throughout the U.S. The Business Channel evolved from PBS's Adult Learning Satellite Service, which had been offering such programmes to businesses by satellite delivery on a subscription basis since the late 1980s. The Business Channel is now an interesting mix of satellite delivery and Web-based instruction.

One stream of instruction delivered by The Business Channel is an executive education programme that has been developed at the Massachusetts Institute of Technology (MIT). The increasing complexity of modern organisations has

created a demand for continuous education for executives, and PBS and MIT have joined forces to fill that demand. Typically, one course is offered each month.

In total, the PBS Business Channel offers approximately 800 training programmes in areas such as executive education, leadership, change, sales and service, computers, human resources, and team building. The video component is delivered via a direct broadcast satellite (DBS) dish that is installed at the work place. Rich resources on The Business Channel Web site enhance the video lessons.

Double Glass Ceiling

Most distance and virtual education programmes in the United States have run up against a double-pane glass ceiling—two barriers that are often not apparent but present real barriers to further development. The first barrier is that the programmes are technology-driven. The programmes themselves are often initiated because a new technology becomes available (e.g., a video-conferencing facility or a new television production studio). Even those that have pedagogical starting points often become "tracked" into a process that uses one or two technologies that invariably introduce limitations to the programme.

The second barrier is that the distance and virtual education programmes adopt a traditional pedagogical paradigm. They create a learning environment that closely resembles the roles, processes, and resources found in face-to-face learning programmes.

In succumbing to these two barriers, distance and virtual education programmes fail to take full advantage of a range of resources available to the instructor and learner alike. Furthermore, they fail to employ the full power of some of the new information and communications technologies to support improved pedagogical approaches.

The concept of the double glass ceiling is presented in graphic form in Appendix 3.1 at the end of this report.

Conclusion

The report has attempted to provide a glimpse of some of the leading edge distance and virtual education programmes in the United States at the beginning of 1999. It is not a comprehensive picture, but it should provide a base for monitoring changes in the evolution of distance and virtual learning in the early part of the 21st century.

In conclusion, we can observe some issues and concerns that might be shared between IHEs in the United States and elsewhere as they attempt to introduce or refine their distance and virtual learning programmes.

- *Technology infrastructure:* In the United States, the communications and information technology infrastructure needed to support and use distance education is quickly becoming available to all IHEs and to more than half of all learners. Almost all IHEs already have Web pages, four out of five are offering one or more distance education courses, and one out of three already offers at least one complete degree programme on the Web. Most institutions have high-speed access to the Web. As for individual learners, almost all have telephones and VCRs in the home and almost half have a computer with access to the Internet. While there is some chasm between the "haves" and the "have nots" in terms of the quality of the equipment, the rapid drop in cost of even the most sophisticated technologies is closing that gap.
- *Financial considerations:* Most distance and virtual learning programmes must be "self-supporting" as far as the IHEs are concerned. Because many evolved from continuing education departments, which traditionally do not receive tuition reimbursement from state or federal agencies, they have had to survive

on the tuition they charge to students. Some students must pay for the courses from their own pockets, while others are reimbursed by their employers. Still others qualify for loans and scholarships from the federal government and other sources. For example, the Regents College Web site lists three sources of funding available from New York State, nine sources of private loans, three college scholarship programmes, and six other sources of potential funding that students can pursue to help them pay for their education. And recently the federal government has introduced a federal tax credit for lifelong learning that lets certain taxpayers reduce their annual tax bills by 20% of the amount they pay for qualified education during the year.

- *Learner and teacher acceptance of distance and virtual learning:* Many faculty members have traditionally viewed distance and virtual learning programmes as second-class education. On the other hand, students and employers do not share that view. For students, access and convenience are primary concerns, and distance and virtual learning programmes have both of those characteristics. Employers look for quality educational programmes that can be pursued conveniently by their employees. Since recent research has shown that distance education programmes are equivalent to traditional ones, students and employers have taken that as evidence that they are being well served. That confidence of the students and their employers has led to an increase in enrolments in distance education courses, which in turn has begun to attract the attention of administrators who are constantly seeking ways to increase enrolments in their institutions. In some cases, the faculty are the last to embrace the idea of distance education. Consequently, the pattern of acceptance is often: employer → learner → administrator → teacher.
- *Reactions of conventional institutions:* As recently as the 1970s, many institutions used to note on transcripts which courses were taken at a distance, reflecting the faculty bias that those courses were inferior. That situation has changed in the past five or so years, to the point where there are very few institutions that make any distinction between distance education and traditional courses, even though a sizeable number of faculty members might continue to harbour their bias. Institutional acceptance of distance education is also evident by the large percentage of institutions that offer distance education courses and the growing number that are offering complete degree programmes at a distance. Many institutions view distance and virtual education programmes as their "growth" area for the foreseeable future.
- *Characteristics of the learners being served:* Perhaps one of the forces driving the changed attitude of institutions towards distance and virtual education is the changing nature of the student body at most institutions. Whereas up into the 1970s the majority of college and university undergraduates were in the 18- to 24-year-old range, the median age now is in the early 30s. Almost all undergraduates hold at least a part-time job as they pursue their studies. As sophisticated consumers with significant disposable funds, they know what it is to expect and receive customer service. They want to be involved in planning their own education and they want that education delivered conveniently so that they can study when and where they are able. They are particularly interested in courses that are practical and that they can begin to use immediately in their jobs.

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home.talkcity.com/UniversityWay : Home Page for Talk City's UniversityWay, an online continuing education service that matches continuing education instructors with institutions that offer continuing education courses online.

http://wsuonline.weber.edu : Home Page for the Online Campus of Weber State University, which offers a wide range of courses and student support services each semester.

www.acenet.edu/calec/home.html : Home Page for the Center for Adult Learning and Educational Credentials of the American Council on Education, which provides a College Credit Recommendation Service that is used by more than 200 corporations, associations, labour unions, government agencies, and training providers that offer courses.

www.advance.upenn.edu : Home Page of PennAdvance, the school-to-college transition programme offered by the University of Pennsylvania in conjunction with the Sylvan Academy/Caliber Learning Network study centres.

www.archipelago.com : Home Page for the Archipelago Company, a division of Harcourt Brace & Company publishers, which is developing multimedia and online college courses.

www.arthurdlittle.com/som/som.html : Home Page for the Arthur D. Little School of Management, which offers a one-year master's of Science in Management programme, as well as a series of executive education and custom programmes.

www.athena.edu : Home Page for Athena University, a non-profit institution administered by Virtual Online University Services International, which provides degrees in Liberal Arts, Business, History, Languages, Math, Science, and Computers.

www.biz.colostate.edu/mba : Home Page for the distance education MBA programme at the Colorado State University.

www.bsu.edu/teachers/academy/outreach.html : Home Page for the Indiana Academy, which offers interactive audio/visual satellite-delivery to K-12 students in subjects that are not available in some schools (e.g., AP Chemistry, Genetics, and Russian).

www.caliberlearning.com : Home Page for the Caliber Learning Network, which offers technology-delivered instruction through a network of learning centres linked together and enhanced by satellite broadcasting, video-conferencing, PC networking and the Internet.

www.california.edu : Home Page for the California Virtual University that links students with distance education courses and support services provided by more than 100 colleges and universities in California.

www.ccconline.org : Home Page for Colorado Community College Online, a co-operative programme of 13 community colleges through which students can earn associate degrees and certificates online.

www.cecc.cccoes.edu : Home Page for the Colorado Electronic Community College.

www.cconline.org/home.htm : Home Page of Cable in the Classroom, gateway to vast educational resources and teacher training provided free of charge by the cable industry.

www.concord.kaplan.edu : Home Page for the Concord University School of Law, a new (October 6, 1998) venture of Kaplan Educational Centers, which offers a juris doctorate degree entirely online.

www.cvn.columbia.edu : Home Page of the Columbia Video Network, established by Columbia University to provide graduate engineering courses to learners throughout the United States.

www.databeam.com : Home Page for DataBeam, a Lotus company that has developed and markets Learning Server, a software package that supports live, interactive training (data, audio, and video) on the Web.

www.digitalthink.com : Home Page for DigitalThink, a privately financed company that offers computer training courses online for Continuing Education Units (CEUs) which are convertible to college credit through an arrangement that DigitalThink has with the University of Phoenix.

www.dowling.edu : Home Page for the Dowling Institute, offering a suite of online training programmes on the use of Microsoft Office.

www.ed.gov/offices/OPE/FIPSE : Home Page for the U.S. Department of Education's Fund for the Improvement of Post Secondary Education (FIPSE), which provides grants for projects designed to improve the availability and quality of higher education.

www.ed.gov/prog_info/StarSchools : Home Page for the U.S. Department of Education's Star Schools Project, which provides funding for innovative projects that use satellite technology to beam courses of study in mathematics, science, and foreign languages to K-12 schools that otherwise would not be able to offer those courses.

www.ed.gov/Technology/eratefacts.html : Home Page for information about the U.S. government's Universal Service Fund, which provides grants to schools to help them install and maintain connections to the World Wide Web.

www.e-education.com : Home Page for software developed by the Jones Knowledge Group to allow instructors to put their courses online.

www.embanet.com : Home Page for the Embanet Corporation, which provides a turn-key solution for building, hosting, and maintaining a virtual campus.

www.fhs.net : Home Page for Florida High School, a state-wide project that aims to place an entire high school online by 2001, including courses and student support services needed to obtain a high school diploma.

www.firn.edu/fdln : Home Page for the Florida Distant Learning Network, a state-wide service to ensure that citizens have access to advanced telecommunications services to complement the provision of educational and health care services.

www.geteducated.com : Home Page of an "adult education and distance learner's resource centre," including access to the *Virtual University Gazette*, a Director of Online Colleges and Universities, and information on the publication, *Best Distance Learning Graduate Schools*.

www.ivu.com : Home Page for the Internet Virtual University, an online campus that colleges and universities can customise and use.

www.lotus.com/learningspace : Lotus Page for information about LearningSpace, its software suite that supports Web-enabled distributed learning.

www.magellan.edu : Home Page for Magellan University, a private online institution that offers courses in advanced mathematics and MCSE certification.

www.mhhe.com/solutions : Home Page for McGraw-Hill's (Publisher) Higher Education offerings which provide online supplements to many of the company's textbooks as well as software and templates that allow universities and faculty members to develop their own Web sites.

www.microsoft.com/education/hed/online : Microsoft's Web Page devoted to online learning (articles, white papers, products, and solutions).

www.ntu.edu : Home Page for National Technological University, one of the first virtual universities in the U.S., with strong programmes of advanced study in Engineering and Business.

www.pangaeanetwork.com : Home Page for The Pangaea Network, a company that helps colleges and universities create their own virtual campus to reach unserved students.

www.paulallen.com/foundations : Home Page for the Paul G. Allen Virtual Education Foundation, which recognises the "best" online course designs and provides the developers with cash awards to design additional courses.

www.pbs.org/adultlearning : Home Page for the Public Broadcasting Service's Adult Learning Service (PBS/ALS), which broadcasts college-level tele-courses, provides satellite-delivered training courses and seminars, and maintains an extensive Web site of ancillary materials and student support services.

www.pbs.org/adultlearning/als/gtd : Public Broadcasting Service Web site for its "Going the Distance" project, to help IHEs develop complete degree programmes using tele-courses and other media-based courses, with a goal of "offering a virtual campus" to every college in the U.S.

www.pbstbc.com : Public Broadcasting Service Web site for The Business Channel, which offers a wide variety of workshops and short courses that it markets to businesses throughout the U.S.

www.quickstart.com/etraining : Home Page for QuickStart Technologies, a company that provides online access to study tools to prepare for Microsoft certification exams.

www.randomhouse.com : Home Page for Random House publishers, source of the publication "The Best Distance Learning Graduate Schools."

www.realeducation.com : Home Page for Real Education, a company that helps colleges and universities put their courses and campuses online.

www.regents.edu : Home Page for Regents College, the first Virtual University in the United States, offering degrees in Nursing, Business, Liberal Arts, and Technology.

www.cscc.cssd.k12.ca.us : Home Page of the California Distant Learning Program (CDLP), the first K-8 online distance learning programme in California and perhaps the only complete programme in the U.S. at this point.

www.scholars.com : Home Page for Wang Global Virtual University, which provides online training and mentoring to the company's 2,500 Microsoft Certified Professionals and 15,000 technical consultants world-wide.

www.sctcorp.com/aspire : Home Page for SCT's Aspire for Higher Education, software and services that allow colleges and universities to develop distributed learning delivery systems.

www.siemenscom.com/Learn.Everywhere : Home Page for the Learn.Everywhere distance education management software from the Siemens Corporation, supporting an instructor led, real-time, interactive learning environment capable of reaching students, staff and faculty across a campus, school district, or around the globe.

www.tc.columbia.edu/~academic/ceot/distlearn.htm : Home Page for a certificate programme in teacher education (Instructional Design and Computer Mediated Instruction) offered at a distance by Columbia University.

www.tolu.com : Home Page for TechOnLine University, a source of continuing education courses (but no complete degree programmes) for engineers.

www.unet.maine.edu : Home Page for the University of Maine's Network for Education and Technology Services, a state-wide delivery system which also provides faculty and student support services for distance education.

www.uol.com/website : Home Page for UOL (University On Line) Publishing, a McLean, Virginia for-profit company that provides interactive and on-demand courseware for training and education.

www.uophx.edu : Home Page for the University of Phoenix, a private university and one of the largest distance education institutions in the U.S.

www.vousi.com : Home Page for Virtual Online University Services International, a source of professional development and lifelong-learning materials.

www.wiche.edu/telecom/telecom.htm : Home Page for the Western Cooperative for Educational Telecommunications (WCET), a division of WICHE that facilitates resource sharing, information sharing, and policy advocacy in the use of educational technologies and telecommunications.

www.wiche.edu : Home Page for the Western Interstate Commission for Higher Education (WICHE), a policy organisation representing 15 Western states in the U.S.

www.wisc.edu/depd : Home page for the University of Wisconsin's Distance Education Professional Development Center, which offers a distance education programme leading to a Certificate of Professional Development in Distance Education.

www.worldclasslearning.com : Home Page for International Thompson Publishing's World Class Learning suite of products that facilitates "anytime, anywhere" learning.

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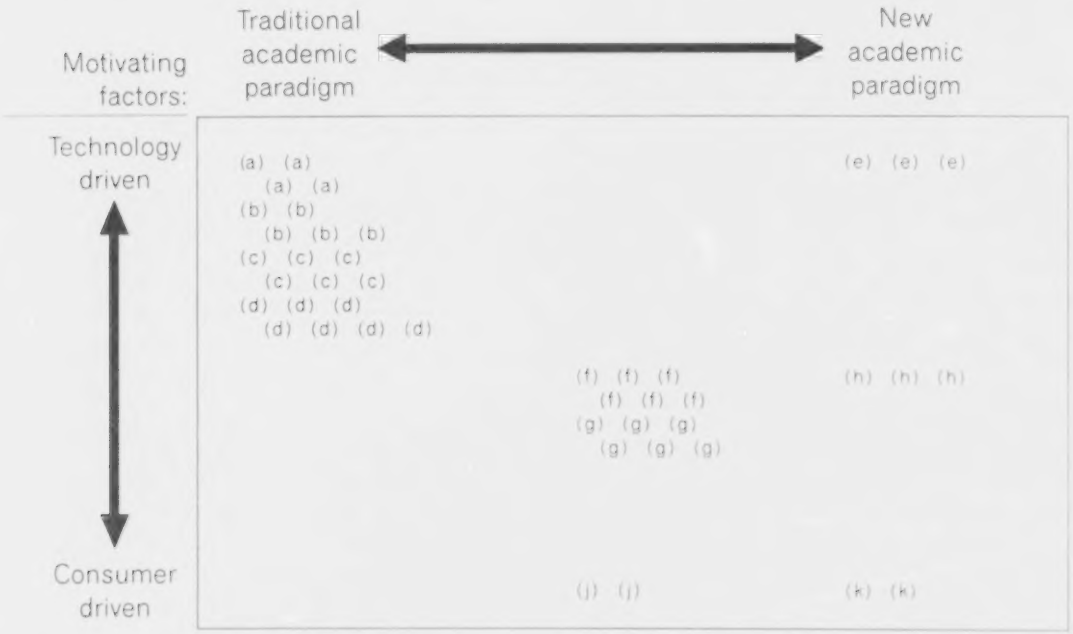
Appendix 3.1:
The Dirr Grid of Tertiary Distance Education

The examples shown in the grid below clearly show that most of today's distance and virtual education programmes are technology-driven and based on a traditional academic paradigm. You are encouraged to plug other distance and virtual education programmes into the grid. I am especially interested in learning about programmes that might appropriately fall into the lower right quadrant of the grid.



Notes:

(a) Educational television programming of the 1950s, such as Sunrise Semester

(b) Telecourses of the 1970s-80s

(c) Audio- and video-conferencing of the 1980s to 1990s

(d) One-off Internet courses and "shovelware" of the 1990s. (These applications tend to be driven primarily by one technology and follow the discursive approach of a traditional classroom. They transfer the traditional classroom paradigm to a new medium.)

(e) Interactive CD-ROM courses of the 1990s. (Some of today's CD-ROM course projects, while still technology driven, are reaching to use the technologies in ways that were not possible before the advent of today's technologies.)

(f) Video and audio courses of the Annenberg/CPB Project of the 1980s and 1990s. (These courses had three unique characteristics: first, they were created to serve a social need to provide tertiary-level educational opportunities to those who could not take advantage of traditional opportunities; second, they took advantage of advanced educational design to allocate to various media the part of the instructional process they could do best; and, third, they had built-in quality control procedures.)

(g) Approach of the Western Governors University. (The suite of products and services provided by WGU is also designed to serve a social need to make educational services available to larger numbers of learners at times and places of their choosing, using a variety of appropriate technologies.)

(h) Approach of innovative corporate universities of the 1990s. (Some corporate universities are developing new pedagogical paradigms that often mix new instructional approaches (such as shorter, more intense courses) and new applications of the technologies.)

(j) Approach of the University of Phoenix. (This is a highly consumer-driven model that uses a mixture of traditional and newer instructional approaches and technologies.)

(k) New services such as those offered by the PBS ACCESS Project. (While not a programme of study, this project is developing a suite of services that will help learners craft an individualised distance education programme by taking appropriate advantage of a variety of instructional packages and support services delivered through a variety of technologies.)

4 Distance and Virtual Learning in the Caribbean

DR. PETER J. DIRR

Introduction

Although often linked to the United States, the Caribbean is a region so different that it is difficult for an outsider to imagine the context in which distance and virtual learning exist. The 30 or more countries that comprise the region are composed of a series of islands and archipelagos and are diverse even among themselves. Some are compact (e.g., Barbados, with a population of 262,000 persons in 166 square miles of territory), while others are dispersed (e.g., the Bahamas, with a population of 273,000 persons on 700 islands and cays scattered over 5,382 square miles). (See Table 4.1) Some lack telecommunications infrastructure (e.g., Haiti, with only one telephone for every 150 people), while in others, most of the population has ready access to telecommunications (e.g., the Bahamas, with one telephone for every two persons).

Many of the countries in the Caribbean are considered lesser developed. Their populations live at poverty levels well below the world average. The education systems in many Caribbean countries lag behind highly developed countries,

Table 4.1

Comparative Statistics for Selected Caribbean Countries Compared to the United States

Country	Area (sq. mi.)	Population (000's)	Life Expectancy	Adult Literacy	Per Capita GDP	Persons/ Telephones	Persons/ TV Sets
Bahamas	5,382	273	72	93%	11,115	2.3	4.6
Barbados	166	262	76	99%	7,538	3.0	3.8
Dominican Republic	18,704	7,900	68	83%	1,600	41.6	10.9
Guyana	83,000	735	65	98%	766	22.3	23.0
Haiti	10,714	7,500	55	35%	400	150.0	234.4
Jamaica	4,240	2,600	75	85%	2,171	12.3	7.9
United States	3,700,000	270,000	76	97%	28,600	1.5	1.3

Source: U.S. State Department, March 1998

so that traditional opportunities for tertiary and secondary education are not available to the majority of the population.

Precisely because of the geographic and economic conditions that confront the countries of the Caribbean, distance and virtual education at both the secondary and tertiary levels could benefit individual countries and the region in general. Yet few Caribbean tertiary institutions are involved in distance and virtual education.

A sense of "regionalism" seems to permeate the Caribbean countries. Sixteen of the countries are members or associate members of the Caribbean Community and Common Market (CARICOM). Eastern Caribbean countries that are members of the Organization of Eastern Caribbean Countries (OECS) share a common judicial system. (See Kenny D. Anthony, *www.oas.org/en/pinfo/legal.htm*) In recent years, they have developed a regional Education Reform Strategy for Eastern Caribbean states to improve the quality and availability of education.

Speaking at a recent meeting of the Organization of American States, the Governor General of St. Lucia pointed to three mechanisms undertaken in the region to improve tertiary education capabilities of the countries. The first was the OECS Education Reform Strategy; the second was a regional network of institutions, the Association of Caribbean Tertiary Institutions (ACTI); and the third was the development of centres of education specialisation, which are assuming regional roles. (See Pearlette Louisy, *www.oas.org/en/pinfo/week/030698ae.htm.*)

The Commonwealth of Learning (COL) has provided continuing support to educational institutions in the Caribbean, including assistance with planning and developing distance education programmes. COL has helped train Caribbean faculty members in ways to re-package face-to-face courses for distance education delivery. It has also facilitated co-operative working relationships between Canadian and Caribbean educational institutions, and has supported a project to upgrade the skills of technical and vocational instructors in the Caribbean. The Commonwealth of Learning Document Archive lists several helpful reports, including a Strategic Plan for providing tertiary education in "non-campus countries" (NCCs) through distance education, and other scholarly papers and reports. See *www.col.org/caribe.htm.* (Also, a search of "Caribbean" or individual country names from COL's home page (*www.col.org*) will provide access to several relevant reports on COL's activities and research.)

The University of the West Indies

The University of the West Indies (UWI) (*www.uwichill.edu.bb*) has emerged as one of the leading tertiary institutions and the leader in providing distance education to residents of most of the countries in the Caribbean. While other institutions in the region have initiated distance education courses and programmes (see below), an examination of the UWI distance education activities provides insight into some of the issues and accomplishments in the region.

The University of the West Indies is an independent institution that serves 15 countries in the Caribbean: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Jamaica, Montserrat, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, and the Republic of Trinidad & Tobago. The university was established as a traditional university with a single campus at Mona, Jamaica in 1948. Originally named the University College of the West Indies, it was affiliated to the University of London. UWI achieved full university status in 1962, one year after it had opened its second campus at St. Augustine, Trinidad. A third campus was opened in 1963 at Cave Hill, St. Michael, Barbados. As a

regional institution, UWI places a strong emphasis on Caribbean issues in both its teaching and its research.

The development of distance education at UWI

The University's present distance education programme evolved out of a "challenge programme" that was started in 1973 by the Faculty of Social Sciences in response to a need in non-campus countries (NCCs) for upgrading and training of mid-level government employees. This programme allowed those employees to study on their own using print resources from the university and then "challenge" the exams in the subjects they were studying. The university provided no additional support to the students beyond a copy of the course syllabus and, where necessary, a list of recommended reading.

The university soon learned that most students could not pass the exams using this form of study, and so it established study centres in the NCCs, where local tutors provided tuition for students.

In the early 1980s, the U.S. government offered UWI use of the ATS6 satellite for academic use. The U.S. Agency for International Development (USAID) also funded a feasibility study that explored offering academic programmes through satellite uplinks and downlinks. This led the university to establish a new administrative unit, the University of the West Indies Distance Teaching Experiment (UWIDITE). By 1983, UWI was offering courses by audio-conferencing, print materials, and local face-to-face tutorial support.

The local tutors were bolstered by teleconferences with campus-based university tutors. Where possible, the academic programmes built on existing infrastructures, including local tertiary learning institutions (TLIs). By the 1990s, this process had become the norm for UWI's distance education programme. The audio-conferencing system was expanded over the years to include more sites with funds from the Canadian International Development Agency (CIDA) and the Caribbean Development Bank (CDB).

As early as 1990, the university made a determination to expand its "outreach and distance education" activities. A July 1992 Appraisal Report noted several issues that needed resolving if such expansion were to be successful. They included:

- *Enrolment:* The report called for increased representation of students from non-campus countries. NCC enrolment had declined from 13% of the total student population in 1960–61 to 5% in 1989–90. Distance education was seen as one way to increase the enrolment of potential students from NCCs.
- *Management of outreach:* The report observed a "bewildering array of offices, units, and faculties operating with minimal co-ordination or even knowledge by the University Centre (which was charged with oversight of outreach and distance education at that time) which were intended to deliver the university's outreach." And none of those entities was integrated with the university faculties, which had primary responsibility for professional continuing education and articulation or franchising relations with tertiary learning institutions. Consequently, distance education was viewed by the faculties as peripheral to the main mission of the university.
- *Inadequate information systems:* The report found "inadequacies in programme planning, communication, record keeping, gaps in services, and duplication of efforts," and, "inadequacies of data on student registration, especially for non-credit courses."
- *Pedagogy and support:* Distance education courses often lacked sufficient back-up material, and technical problems plagued the UWIDITE conferencing system.

- *Training:* A great need was found for "extensive training in all aspects of distance education." At the same time, the report noted that there were no agencies devoted to improving pedagogy anywhere in the university.
- *Computerisation:* Although this report predated the explosive use of computers and the Internet worldwide, it envisioned the use of computers university-wide for various educational purposes, including the support of distance education.
- *Needs assessment:* The authors of the report found deficiencies in how the university determined the need for outreach and distance education, as well as its own needs for change in order to adapt to a rapidly changing educational environment.

One of the outcomes of the 1992 Appraisal Report was a recommendation to develop a Distance Education Unit, reporting directly to the Board for Distance Education and chaired by the Vice Chancellor of PVC Academic Affairs. That recommendation was accepted, and since 1996 distance education at UWI is managed through the Board for Non-Campus Countries and Distance Education (BNCCDE). That Board is an office of the University Centre, located at the Cave Hill campus in Barbados. It oversees three executive arms: the Distance Education Centre (DEC), the School of Continuing Studies (SCS), and the Tertiary Level Institutions Unit (TLIU).

Another issue that surfaced in 1992 was whether distance education would be freestanding or integrated within the existing university departmental structure. It was seen as a fundamental issue to choose between a dual-mode distance education operation and some form of autonomous distance education programme (what was referred to as a possible "fourth campus" of the university). The latter would have centralised all responsibilities for distance education and perhaps have permitted greater flexibility than some campus-based faculties might be willing to tolerate. But the Renwick Report recommended against this option on the grounds that it might preclude opportunities for mutual enrichment of the on-campus and off-campus programmes, and the possibility that the distance education programme might be seen as being of lesser stature than on-campus programmes. Dual-mode was intended to assure that neither modality was superior.

The dual-mode route was chosen. Consequently, distance education at UWI today largely consists of courses that the university faculty produces. Distance education has become an integral part of the workload of the university departments—part of the normal duties of the faculty. And just as the academic programmes are dual-mode, so are the support areas of the university, offices such as the registrar and information services. One by-product of the decision, however, was a parallel decision to keep the matriculation requirements the same for both modes, which has made UWI distance education programmes less "open" to non-traditional adult students than distance education programmes at some other institutions.

Another fundamental issue faced at that time was what role technology would play in the delivery of distance education. On the one hand, technology could make rich educational opportunities more widely available. On the other hand, if the access to technologies became an integral part of the delivery system, it could limit participation by large numbers of potential students, especially in poorer countries. The decision was made that, given the under-representation of students from NCCs, and in order to serve those potential students more completely, print materials would dominate the support materials for distance education courses. Teleconferencing (as used by UWIDITE) required regular attendance

at university centres. Print-based materials could be used anywhere, any time the student wished.

In recent years, the typical structure of UWI's distance education courses is a print-based study package with a heavy reliance on tutorial assistance. Often, the student must attend a prescribed number of sessions in-person with a local tutor, plus some at a distance with a campus-based tutor through audio-conferencing.

The 1997–98 academic year saw a large jump in distance education enrolments at UWI, which has been attributed to improved marketing of courses and the notion of distance education in general.

A June 1998 paper on a new strategic plan for distance education reviewed the progress of the previous five years. Here is what it found in the key areas that had been identified as concerns in 1992:

- *Enrolment:* Looking at figures available at that time, the authors reported that, "Here the picture has remained bleak." Non-campus countries (NCCs) are under-represented in on-campus enrolments. This need has not changed much since the 1992 Appraisal Report. The NCC countries now contain 22% of the population of the UWI contributing countries, but their nationals acquired only 9% of the undergraduate degrees awarded by the university in 1993 and only 14% of the certificates. The northwest and eastern Caribbean countries are especially hurt in this distribution. They each have 11% of the population, but the northwest countries contributed only 1% of the on-campus registrations and the eastern countries contributed only 5%. One solution the university is pursuing is to place greater emphasis on involving local TLIs in distance education programmes, promoting the notion of the university as a hub and the TLIs as the spokes in an integrated regional system. However, the situation is compounded by inequities in "sponsorship" in the NCCs. While the campus countries sponsor all their undergraduate students and many of their postgraduates, most NCCs set significant limits on the number of students they sponsor. This is further complicated because the fees for non-sponsored students from NCCs are so high that most potential students find it cheaper to attend North American institutions. (Roughly nine times as many students go to North America as go to UWI.)
- *Management of outreach:* Many changes were made to the structure and management of distance education at UWI following the 1992 report. BNCCDE now sets the policy for outreach and distance education and directly supervises three units: Distance Education Centre (DEC), School of Continuing Studies (SCS), and the Tertiary Level Institutions Unit (TLIU). DEC is responsible for the telecommunications system and computer network used for distance education, embracing three campuses, several other sites in the campus countries, and sites in all of the NCCs. In 1993–94, UWIDITE was integrated into the DEC, linking the university's three campuses with University Centres in Antigua, Grenada, St. Lucia, St. Vincent, St. Kitts, and Dominica through local telecommunications networks.

  Since 1993–94, the university budget for distance education has increased from J$23.5 million to J$143 million in 1998–99. SCS is responsible for a variety of non-credit courses and for managing the sites used by the DEC teleconferencing system. The TLIU facilitates articulation between regional tertiary-level institutions and the university and assists the TLIs in upgrading their resources. This new structure has not given control over all aspects of outreach and distance education to the BNCCDE. The professional

faculties or schools retain responsibility for professional continuing education, although some of the work involves DEC, SCS, or the TLIU.

- *Inadequate information systems:* An almost accidental step towards a solution of the need for adequate information systems has been the slow but sure implementation of computer connectivity across the campuses, an activity stimulated by a loan from the Inter American Development Bank. However, improvements in registration and other student data are moving very slowly, apparently reflecting an unwillingness to recognise that dual-mode includes administrative as well as academic functions.
- *Pedagogy and support:* The university has implemented several measures aimed at improving pedagogy. They include:
  1. Regularly assessing teaching staff.
  2. Making teaching an explicit consideration in the assessment and promotion system.
  3. Providing instructional development units at each campus to help faculty members.
  4. Developing training manuals for faculty members.
  5. Developing a Certificate in Adult Education for tertiary level teachers.
  6. A new programme for the production of high-quality print materials and a range of other media.
  7. Peer review of such materials, using staff from other campuses and institutions.

  Self-instructional print-based materials remain the fundamental resource for distance education courses, but in some cases Web pages play a large role. Greater attention is paid to the role of local tutors and to providing students with local support systems. What has proven particularly difficult to change, however, is the weaning of staff away from proprietary course development towards a team approach.
- *Training:* There has been much achieved in the actual training of all categories of staff involved in distance education, and in policy recognition for continuing this training. The DEC is the main source for such training and has produced some self-instructional manuals for administrators and local tutors.
- *Computerisation:* Five years ago, no one anticipated the appearance of the Internet or the range of software applications that would be available. The university has capitalised on loans from the Inter American Development Bank and the Caribbean Development Bank to equip the campus.
- *Needs assessment:* Using funds from the Caribbean Development Bank loan, DEC will create a new post for research and evaluation in order to conduct needs assessments on a regular basis in collaboration with the BNCCDE Research Office.

One of the remaining challenges, not highlighted in 1992, is the provision of library services. Limited resources are often spread too thin among a public library system, the local TLI library, and the University Centre. This compounds another challenge: the need to bring the cultural and intellectual atmosphere of a thriving university to the NCCs through relevant activities that might enhance the quality of public discussion throughout the region. An expanded and comprehensive distance education programme was seen as one way to address these needs.

UWI continues to respond to known needs on several levels. Working with TLIs and other local education providers in the NCCs, the university has expanded access through courses offered at remote locations. It has also identified several areas where distance education courses can expand access, including Internet versions of some physics courses, strengthening mathematical and statistical understanding among potential students, and increasing English proficiency through remedial and preparatory courses. Some of these efforts cause the university to continue to examine its entry requirements and policies, which to this point have been rather traditional and rigid and unfriendly towards "mature students." (See the reference above in the context of the discussion of the nature of a dual-mode institution.)

The University of the West Indies' literature indicates that distance education continues to be seen as the major source of increased access to programmes of all kinds. However, given the circumstances of the Caribbean, for the immediate future, information and communication technologies apparently will not play a major role in distance education. Start-up costs for technology-based distance education programmes are high and some technologies are not readily accessible to many of the students the university hopes to serve through new distance education programmes. The university is very conscious of the need to weigh carefully the value of the technologies and not to under-utilise some low-tech approaches that might serve large numbers of potential students. Consequently, the university has made it a goal to strengthen its print-based courses so that the course materials can bear more of the burden of tuition. The hope is that by strengthening the course materials, the university will be able to facilitate anytime, anyplace learning while reducing the currently strong reliance on local tutorials. At the same time, however, the university is upgrading its technological infrastructure (e.g., computers, connectivity, e-mail facilities) as part of a shared effort throughout the eastern Caribbean. As that upgrade is completed, the university expects to add video-conferencing to its current audio-conferencing facilities.

In summation, the University of the West Indies has moved from viewing distance education as an experiment to be tried with individual isolated courses to its current stage of developing and offering complete degree programmes. All of the courses offered are print-based.

In expanding its distance education, UWI has dealt with many "usual" issues:

- Finding ways to articulate distance education programmes with the academic programmes of local tertiary institutions.
- Helping faculty see the development and offering of distance education programmes as team work rather than purely individual efforts.
- Keeping open to the possibility that the distance education courses might be a small element in an academic programme that allows a co-operating TLI to expand its current academic offerings or introduce specialisations it would not otherwise be able to offer.
- Accepting that mixed mode delivery will be the norm rather than the exception, not only for distance education programmes but for on-campus courses as well.

Even as it expands its distance education programme, the University of the West Indies is aware of the fine line it must walk. Of all the tertiary institutions in the region, UWI is best equipped to provide educational opportunities to students throughout the region. Yet, it must take care not to step on the toes of other universities and established tertiary-level institutions. Rather, it must consider ways that, in each country, the various

players might co-operate and collaborate, given that each institution will have its own aims, some of which might conflict with UWI's. The university has chosen to do what only a university can do, including the pioneering of new programmes that others can adapt or adopt, and leaving to others to do what they can do perfectly well on their own.

Other Institutions and Programmes

Other Caribbean institutions also offer some distance education programmes and courses, some in conjunction with the University of the West Indies. Throughout the region, traditional colleges and universities have experimented with distance education and continue to do so. Most, however, are constrained by the lack of facilities, equipment, and infrastructure, preventing them from taking advantage of the very technologies that are making distance education a reality in other parts of the world.

Over the past decade, there have been several region-wide projects sponsored by the Commonwealth of Learning (COL) that have used distance education approaches and technologies to improve educational opportunity and quality in the Caribbean. For example, COL helped the University of Guyana develop a distance education programme of pre-university courses. Delivery included development of learning materials (using a new desktop publishing approach) and installation of an audio-teleconferencing network between Georgetown and seven regional study centres.

- *Sir Arthur Lewis Community College*, through its Department of Continuing Education (DOCE), provides lifelong learning opportunities to adults in St. Lucia. During the 1998–99 academic year, they are offering seven courses leading to secretarial and business studies diplomas. (See their Web site at *www.tcol.co.uk/orgs/sarthur/sarthur.htm.*)
- *Antigua State College* has been the main partner with the UWI in Antigua. It has franchised several UWI courses.
- *The British Virgin Islands:* UWI works closely with a local TLI to provide a degree in Education using a variety of resources and approaches. The major competition has come from the University of the U.S. Virgin Islands (See their Web site at *www.uvi.edu.*)
- *Cayman:* Articulation arrangements between UWI and the local community college on Cayman, including provision for dial-up access to UWI's computers, is providing greater access to higher education to island residents. However, most advanced tertiary training is undertaken in the United States.
- *Grenada:* The national TLI, T. A. Marryshow Community College, and an active off-shore institution, St. Georges University, work with UWI to offer courses.
- *Turks and Caicos:* The Community College on Grand Turk has a UWIDITE facility that is just going into operation. A main concern is that they might not be able to find sufficient local tutors.
- *Jamaica:* COL assisted the Ministry of Education in launching the Teacher Training Project, which upgraded 200 primary grade teachers from a certificate to a diploma qualification in the pilot phase alone. Also in Jamaica, under a World Bank project, distance education is featured prominently in the teacher training and upgrading component of a project to reform secondary education.
- *Haiti:* The Haitian Foundation for Private Education (FONHEP) has developed a pilot project to test the feasibility of distance education as a vehicle for delivering

high-quality instruction to the country's primary schools. Emphasis is on interactive radio instruction (IRI) as the primary learning channel, supplemented by printed materials (e.g., posters, teacher guides, student workbooks). Technical assistance is being provided by project ABEL (Advancing Basic Literacy and Education).

- *Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines* are participating in a distance education pilot project being conducted under the auspices of the COL Organization of Eastern Caribbean States (OECS). The pilot will demonstrate the practicality of offering print-based courses by distance to a number of different sites in the region.
- *Trinidad and Tobago:* As recently as December 1998, Trinidad and Tobago launched a nationally co-ordinated system of distance learning. It holds promise of advancing educational opportunities to new cohorts of students.

Training workshops have been held throughout the Caribbean region to enhance institutional capacity and distance education. The workshops have covered the use of the computer in distance education, adaptation of distance learning course materials, planning and management of student support services, and course design for interactive audio-teleconferencing.

One promising development for the region is the Caribbean University Network (CUNeT), a project directed by the University of Puerto Rico to facilitate access to e-mail to universities and institutions in the Caribbean. Increasingly, there are nodes of computers that connect several institutions to the server at the University of Puerto Rico through dial-up technology. Funding is provided through the Organization of American States (OAS).

Conclusion

The very geography of the Caribbean region requires that tertiary-level institutions consider distance education in one form or another unless they intend to serve a small number of students each year (as many choose to do). So far, most of the distance education programmes have taken the form of either place-bound classes (e.g., in community learning centres) that are at a distance from the provider institution, or print-based courses that can be taken anytime, anyplace by students who have the study skills and motivation to pursue correspondence courses. Those colleges and universities that have tried to develop distance education programmes using today's technologies have run into barriers in the form of high costs, lack of faculty skills needed to take advantage of the technologies, lack of student access to the technologies, and lack of infrastructure to deliver the instruction.

The University of the West Indies seems to be the university that is most active in distance education in the region. It has chosen to limit the use of information and communication technologies in the delivery of distance education courses to avoid precluding any potential students from taking those courses (e.g., because they do not have access to the technologies or because the communication infrastructure does not exist in their part of the country).

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5 Open and Distance Education Programmes in Latin America

DR. VICTOR GUERRA ORTIZ

Introduction

At present, practically all Latin American countries have adopted distance education as a fundamental tool to combat educational backlog and to improve the quality of teaching. Perhaps the main reason for adopting this particular educational model, based on the implementation of new technologies, is its high viability, since with a relatively small number of economical and qualified human resources, large sectors of the populations can be reached.

Background

Mexico is one of the countries with the greatest experience in the field of distance education. Over 31 years ago, Mexico launched the *telesecundaria*, a televised basic distance secondary programme, which currently has a total enrolment of over 800,000 students. Other countries have implemented effective distance programmes as well.

The earliest ventures into open educational programmes in Mexico go back to 1947, with the establishment of the Public Education Ministry's Federal Teacher Training Institute, aimed at training teachers without interrupting their regular work schedules. This institute, the first attempt at open and distance education in Latin America, offered correspondence and on-site courses. The model continued until 1975, when it was transformed into the General Office of Teacher Training and Improvement, offering open courses towards degrees in preschool and primary school education. This institution, in turn, generated the Universidad Nacional Pedagógica (UPN) Open and Distance Educational System.

Open and distance education in Mexico is legally based on the individual and social principles stipulated in Article 3 of the Mexican Constitution. Therefore, Mexican law regards distance education as one of the official educational models upheld by the General Education Law, the National Development Plan for 1995–2000, and the numerous programmes derived from these laws.

Present Educational Conditions in Mexico

- Population: 95,000,000
- Illiteracy: 8.42% (men) 12.66% (women)
- Illiterate population by age groups: From 6 to 14, 13.78% (men) and 48.05% (women); Over 15, 10.6% (men) and 51.52% (women)
- Children of school age who do not attend school: 12.02% in areas with under 15,000

inhabitants; 4.21% in areas with over 15,000 inhabitants

- Areas with under 100 inhabitants: 201,138

As is evident from the above statistics, there is a significant number of children and young people who do not attend school and who live mostly in scarcely populated areas, which makes traditional education (i.e., building and operating schools) extremely costly. (Further statistics are provided in Appendix 5.1 at the end of this report.)

In Mexico there are 51 institutions offering distance education, all having either national, regional, state, or local coverage. They include the basic (K–12), high school, and university levels. Both public and private institutions participate in these programmes, although the latter has the greatest scope, both in regard to population coverage and quality.

For the secondary school cycle, that is, the seventh, eighth, and ninth grades, there is the *telesecundaria*, the televised secondary school programme enabling students in isolated areas, who completed their primary education, to continue their secondary school education with aids such as television, supervisors, and written didactic materials.

The term *teleducación* was first coined in Peru in 1960 to describe the long-distance transmission of educational messages, mainly through television. Subsequently, with the incorporation of other communications, media, and pedagogical resources, open and distance education programmes were instituted. What differentiates them from traditional education models is that they provide an alternative to the on-site interaction between teachers and students.

In Mexico, the most successful, motivating force to televised educational programmes has been the *telesecundaria*. It consists mainly of special televised programmes transmitted by the Edusat system, which requires even more interactivity in order to improve the teaching-learning process, since the only model features a tutor-teacher. It began operating in 1968, mainly in communities with a population under 2,500 inhabitants. After 31 years of experience in the *telesecundaria*, Mexico has attained a quality comparable to that of the on-site systems.

The National Distance Education programme

The main purpose of the SEP's (Ministry of Education's) National Distance Education Programme (PROED) is to raise the level of educational opportunities by incorporating electronic and computer technology media into education. Its intention is to expand its coverage, combat educational backlog, and promote training programmes for human resources.

This programme consists of three fundamentals: the Educational Satellite Television Network (Edusat), the Educational Data Processing Network, and the National Educational Video Library.

Basic education

Primary school and *teleprimaria*

Mexico's entire basic education system received a tremendous boost to distance education with the establishment of the *telesecundaria* in 1968. It was during the 1970s that this educational model reached its peak. That same year, a presidential decree established the CEMPAE, (Center for the Study of Advanced Educational Media and Procedures.) The CEMPAE was an organisation that supported the development of educational technology, and its implementation eventually led to the creation of the pilot for the very first genuine open secondary school programme in the country.

As a direct result of this experience, this model soon extended to the basic level (Intensive Primary for Adults and Open Secondary School programmes), which served as the basis for the

establishment in 1976 of the National Adult Education System, an agency of the SEP.

During the past 40 years, Mexico has made tremendous efforts to extend its educational services to a larger number of people. Consequently, the average schooling on a national level has almost tripled. In 1960, Mexicans over the age of 15 had only completed an average of 2.6 grades, but as of 1998 that number was up to 7.7. The magnitude of this progress can be more fully appreciated when you consider that since 1960, the country's population has increased from 35 million people to almost 100 million.

On the basic level, the work carried out by the National Institute for Adult Education (INEA) has played a vital role. It has national coverage and offers intensive primary programmes for adults as well as open secondary school programmes. Its curriculum is based on a "didactic package" made up of texts, radio, and television programmes

INEA's services also include literacy programmes and informal job training courses aimed at people over the age of 15 with either no schooling or whose basic studies are incomplete. They are given access to basic education in order to improve their personal and employment opportunities. It is estimated that in 1998, over 2.5 million adults attended the literacy, primary, secondary school, and informal job training programmes. This figure represents 14.4 % increase in one year, equivalent to over 320,000 additional persons who received this service.

The *teleprimaria* is another measure implemented by the Mexican government to provide relevant, high-quality education with greater coverage to all Mexicans.

Telesecundaria

The *telesecundaria* in Mexico continues to play a supremely important role at present, with more than 12,000 schools totalling approximately 800,000 students and 23,000 teachers.

In 1998, due to the establishment of 973 new units (77% of the total of new secondary schools), a total of 817,200 students received the *telesecundaria* service, representing an 8% increase over the previous cycle. Within the past three years, this mode has reached 198,600 additional students, representing a 32% increase.

Educational Network

The Educational Network is a computerised system of information and communication based on the Internet at the service of Mexico's student community. It provides both teachers and students with a series of pedagogical and informative resources aimed at improving the learning-teaching process.

Educational Network launched its operations in 1997 with a pilot programme. At the same time, a teacher-training programme was held, with extremely positive results. At present, there are 4,000 units installed in more than 1,000 educational units.

The Educational Networks is, above all, a community of teachers, students, and parents joined together by this effective educational computerised system.

Edusat

Edusat (Educational Satellite Television Network) is a closed-circuit system managed by the SEP. The system, based on the most advanced digital technology, launched its operations in 1994. Its 6 television and 24 audio channels broadcast all over Mexico, southern United States, Central America, and part of Latin America. It is expected that, with the development of the Mexican satellite system, like the launching of the Satmex 5 satellite, Edusat will soon have continental coverage and double its number of channels.

To date, Edusat has surpassed its originally programmed goal, which was to reach over 9,000 schools throughout the country to provide basic education to remote, outlying areas. At

present, it reaches over 10,000 schools with a total of 20,000 receivers.

Edusat's programmes contain scientific, technological, and cultural information, as well as orientation programmes for parents, updating courses for teachers, support for preschool children, sports, and many other subjects, besides transmitting several programmes offered by the open circuit cultural channels 11 and 22.

High school education

On the secondary school level, which covers the 10th, 11th and 12th grades, there are 21 institutions, most of them state government units offering both open and distance education.

Ever since the Colegio de Bachilleres was founded in 1976, it established its open education system (SEA) and became the pioneer in open secondary school programmes in Mexico.

In 1979, the Open High School System was established, as part of the activities planned by the previous CEMPAE. CEMPAE continued to evolve its open programs, and in 1983, when the organisation was declared extinct, both the INEA (created in 1981) and the General Office of Educational Evaluation, also an agency of the SEP, were placed in charge of the entire basic and secondary school system, respectively.

The Inter-institutional and Interdisciplinary Commission for Open and Distance Education was established in 1991 to serve as a mechanism for standardising criteria and as a liaison among the different institutions. Among its most important activities are the creation of a national inventory of institutions dedicated to this mode of education, training programmes for specialised human resources, and the organisation of open and distance education congresses on a national level. During its recent fifth national congress, one of its principal achievements was the establishment of quality criteria and standards.

University education

There are 24 institutions offering distance education at the university level. Eight of them operate on a national or regional level, while the rest are on the state level. Of these institutions, only two are private.

UNAM

In the public sector, the most important is undoubtedly the Universidad Nacional Autónoma de México (UNAM). Its national coverage offers over a dozen university degrees. It is currently in the process of developing other programmes such as the tele-campus, aimed at systematising and expanding distance educational services via receiving centres throughout the country.

UNAM established its SUA (open university programme) in 1972. The philosophy behind this system is to extend university education to large sectors of the population through "theoretical- and practical methods of transmission and evaluation of skills, along with the creation of learning groups that will work both in and outside the university's classrooms."

UNAM's open programme offers the bachelor's of arts degrees in the following disciplines:

- Accounting
- Administration
- Communications
- Economics
- Education
- Geography
- Hispanic Languages and Literature
- International Relations
- Law
- Modern Languages and Literature
- Nursing (as well as Technician in Nursing)
- Philosophy
- Political Science

- Public Administration
- Psychology
- Sociology

ITESM Virtual University

The ITESM (Technological Institute of Monterrey's) Virtual University constitutes a comprehensive postgraduate learning-teaching system and operates via the most advanced telecommunications technologies and electronic networks. It supports the ITESM's own campus and provides education to different sites in Mexico, Latin America, the United States, and Canada.

ITESM Virtual University offers a total of 12 master's degrees and doctorate programmes in the fields of Education, Administration, and Engineering and Technology. It also aims special projects at corporations, such as the AVE (Virtual Corporate Classroom) and the PEE (Exclusive Corporate Programs) as well as several programmes aimed at developing and updating teaching skills. Altogether, the university reaches 29,887 students through its reception centres distributed throughout the continent.

In addition, ITESM Virtual University also offers a development programme for secondary school and basic education teachers, both in Mexico and in other Latin American nations. This programme focuses on teaching abilities and special skills required for teaching Mathematics, Science, and Spanish.

Perspectives on Distance Education in Mexico

The teaching-learning process substantially improves with the use of information technologies. In Mexico, the main elements in information technologies are computer science, telecommunications, and educational television.

Today, the teaching profession almost always resorts to a combination of these media. Ideally, this combination will produce the best results, both in on-site and in distance education. The extremely valuable educational infrastructure and models contributed by SEP should serve as the cornerstone to developing distance education in Mexico. Both Edusat and Educational Data Processing Networks are outstanding in their basic education activities (as already mentioned), but it must be stressed that they are open to the entire national educational system, as corroborated by the fact that a number of universities, mainly UNAM, avail themselves of these services.

High school programmes

- Virtual institutions
- Master's degree in Educational Technology by ILCE

On-line B.A. programmes for the 2000–2001 semester

- ENEP—Nursing
- FCA—Accounting
- FCP yS and ENEP-A—International Relations
- FD and ENEP-A—Law
- FE—Economics

Joint distance postgraduate programmes

- Computer Sciences and Engineering (FI, FC, FES-C, IIMAS, IE and IM)
- Oceanography and Limnology (FC, FQ, ENEP-I, ICCyL and IG)
- Biomedical Sciences (FM, FMVZ, IE,IFC, IIB, IQ, CIFN and CNB)
- Institutional master's degrees (IMP, UNAM)
- Joint master's degrees: M.A. in Education and Data Communications (Telematics) granted by the Organización Universitaria Interamericana's (OUI) Colegio de las Américas

Continuing education

- Certificate course: High Management in Nursing Services (UAM, UNAM, U-Veracruzana)
- Certificate course: Data Processing for Medical; Decision-making (UNAM's School of Medicine)
- Certificate course: Construction Costs (School of Engineering)
- Certificate course: The computer in teaching activities (DGSCA)

Teacher training programmes

- Laboratory for Computer Science Teaching (ENEP Iztacala)

Education technologies

- UNAM's comprehensive network (RedUNAM)
- Every institution of higher education and a growing number of level K–12 institutions are equipped with Internet services. Installed capacity: approximately 100,000 computers.
- Over 30 international links (to the U.S.A.)

National Videoconferencing Network

The UNAM is the main centre of operations for the National Videoconferencing Network, with 80 units distributed throughout different educational institutions and public sector organisations in the country.

- UNAM is equipped with 23 units on campus and 2 in San Antonio, Texas and Hull, Canada.
- The UNAM is permanently linked to the University of Texas video-conferencing system, equipped with 122 sites
- Permanent link with TTVN (Trans-Texas Videoconferencing Network), the Texas A & M University's Video-conferencing Network with more than 90 sites throughout Texas
- Its permanent Open School in San Antonio, Texas, serves as a link to any videoconferencing site in the world equipped with ISDN

EDUSAT
(Educational Satellite Television Network)

- Approximately 30,000 educational units with EDUSAT, particularly in secondary schools
- 1,895 hours of transmission during 1997 via EDUSAT
- 750 videos produced during 1997, ranging from one-minute informative spots to one-hour science videos
- The trace of EDUSAT's satellites covers a major sector of the United States and Latin America

Educational Data Processing Network

- 2,300 educational units and close to one million participating children

However, it is also necessary to guarantee easy access to the media by creating fully equipped schoolrooms, centres, and laboratories near the user's place of residence. At first, because investment and access to courses, libraries, data banks, evaluation systems, and didactic materials are difficult to obtain, inter-institutional co-operation is absolutely indispensable. Each institution contributes part of the input, to the benefit of all concerned. The basic input must include the following:

- Courses, educational spots, didactic material, curriculum, study programmes, etc.
- Evaluation and certification systems
- Internet 2 (high capacity and low cost for educational purposes)
- Interactive video-conferencing network for courses requiring considerable interactivity
- Educational television system for teleconferences and video on demand
- Libraries offering digital service.
- Information distribution tools (Web, "push technologies," CD video servers)

Table 5.1

Distance Education in Mexican Universities

Public institutions	Distance education programmes: curriculum and objectives	Media and technology used
Benemérita Universidad Autónoma de Puebla		Interactive video-conference Television via satellite
Centro de Investigación y Estudios Avanzados	Inter-campus communication Conferences	Interactive video-conference
Instituto Politécnico Nacional	Continuing education	Interactive video-conference Television via satellite
Instituto Tecnológico de Sonora	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Autónoma de Baja California	Inter-campus communication	Interactive video-conference Television via satellite
Universidad Autónoma de Baja California Sur	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Autónoma de Chihuahua	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Autónoma de Ciudad Juárez	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Autónoma de Guerrero		Interactive video-conference Television via satellite
Universidad Autónoma de Nuevo León	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Autónoma de Sinaloa		Interactive video-conference Television via satellite
Universidad Autónoma de Tamaulipas	Postgraduate studies Inter-campus communication	Interactive video-conference Television via satellite
Universidad Autónoma del Estado de México	B.A. in other fields	Materials delivery (written material and videos mainly) Television via satellite
Universidad Autónoma Metropolitana	Inter-campus communication	Interactive video-conference Television via satellite
Universidad de Colima	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad de Guadalajara	Continuing education B.A. and postgraduate studies	Television via satellite Audio-conference
Universidad de Occidente	Continuing education and Postgraduate studies Inter-campus communication	Interactive video-conference
Universidad de Quintana Roo	B.A. courses imparted by other universities	Interactive video-conference Television via satellite
Universidad de Sonora	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Juárez del Estado de Durango	Continuing education Postgraduate studies	Interactive video-conference Television via satellite
Universidad Nacional Autónoma de México	B.A. Continuing education Postgraduate studies Inter-campus communication	Interactive video-conference Television via satellite, Internet
Universidad Pedagógica Nacional	Continuing education	Television via satellite
Universidad Tecnológica de Nezahualcóyotl	B.A. Continuing education	Interactive video-conference
Universidad Veracruzana	Inter-campus communication Continuing education	Interactive video-conference Television via satellite
Private institutions		
Instituto Tecnológico Autónomo de México	Continuing education	Television via satellite
Instituto Tecnológico de Estudios Superiores de Monterrey	Continuing education Postgraduate studies	Television via satellite Internet
Universidad Anáhuac	Inter-campus communication	Interactive video-conference Television via satellite
Universidad La Salle	Inter-campus communication	Interactive video-conference
Universidad Regiomontana		Internet video-conference

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Computer Technology and Telecommunications in Mexico

During the past decade, Mexico has experienced a substantial growth in its computer and telecommunications infrastructure. This increase has never been under 20% a year.

In the field of telecommunications, Mexico has 12 telephone sets for every 100 inhabitants and a modern digital telecommunications infrastructure that includes 1,000 miles of optical fibre and numerous international links.

It has satellites with continental coverage, the most modern being the Satmex 5. The computer system includes 4.2 million installed computers, 600,000 of which will have access to Internet as of this year.

Several tables describing the existing infrastructure and projects for the near future appear below.

Current capacity for computer equipment (installed and estimates)

To fully understand the Internet services market, it is necessary to update the number of personal computers throughout Mexico by economic sectors. We estimate that, in 1998, the number of PCs totalled 4,167,518, considerably less than the originally estimated figure. This discrepancy is mainly due to the prevailing international financial situation, characterised by instability and economic deceleration.

Furthermore, in 1998, the home sector maintained a growth of 23% compared to the previous year, since several manufacturers offered attractive financing packages to stimulate the demand from home users and companies alike.

The education sector maintains its 5% participation for the next few years, although it is definitely still a market with ample possibilities for expansion since the industrial sector has agreements with private universities to promote the use of technology in education.

The Internet services market continues to register significant growth in Mexico, with favourable prospects for the next few years, especially in regard to the number of users. It is estimated that by the end of 1998, 1.3 million additional users were connected to the network either via modem or corporate link systems.

Although the number of Internet users continues to grow at a high rate, it is limited by the number of personal computers. In 1997, the number of PCs installed in Mexico totaled 3.5 million, and by the end of 1998 this figure will have reached 4.2 million, that is, a 19% increase.

Furthermore, it is estimated that, in 1998, 384,000 computers were connected to Internet via modem. This figure represents a 123% increase compared to the previous year, which was bol-

Table 5.2

Installed Capacity of PCs in Mexico

	1997	1998	1999	2000	2001	2002
Home	786,068	966,003	1,158,443	1,365,001	1,614,331	2,013,909
Government	263,331	354,239	460,944	595,671	761,741	947,722
Education	175,554	208,376	242,602	283,653	331,192	394,884
Business	2,286,127	2,638,900	2,990,056	3,428,729	3,916,572	4,541,167
Total	3,511,080	4,167,518	4,852,045	5,673,053	6,623,835	7,897,681

Source: Select IDC, October, 1998

stered by the new PCs on the market offering the possibility of connection to online services.

In the services market for access via modem, the business sector is the most important, followed by home users. The segmentation of access accounts and users by economic sector is based on two conditions: the place where the access computer is located and the economic sector that pays for the user's access. Likewise, for the services market for access to Internet via dedicated line, the business sector is once again in the lead, this time, followed by the educational sector. Prior to the boom in Internet access services in Mexico registered in mid-1995, the educational sector was the largest participant in terms of the number of users and personal computers connected via a dedicated line. As of 1996, Mexican companies have been the principal promoters of this service.

However, according to estimates by the Select-IDC company, the number of users from the educational sector will soon surpass those in the government sector, both in regard to dial-up service as well as in the dedicated line service.

Select-IDC also estimates that within the next few years, the educational sector will not be represented by universities only, but also by other academic institutions such as preparatory and even secondary schools. Internet access devices will gradually replace television sets as interactive teaching instruments. Probably, at first, there will be from one to three computers per school, connected by dial-up links, but the number of devices and especially of users can significantly increase over the next few years. In order for this to occur, however, there are two matters that must be attended to: reducing the cost of PCs and increasing the number of telephone lines.

Private homes have a greater ratio of users for each account (2 to 1). Because we are referring to a segment that includes users from every industry and if someone has an Internet connection, sponsored by his or her company or educational institution, there will be greater interest in paying access service to the home, which can be used by one or more individuals.

Table 5.3

Internet Access Accounts in Mexico

	1997	1998	1999	2000	2001	2002
Home	67.085	130.504	230.866	357.339	516.431	738.929
Government	10.144	23.407	37.673	59.469	106.623	142.239
Education	118.935	274.466	339.289	502.181	584.045	1.005.615
Business	177.030	436.987	781.936	1.169.017	1.665.963	2.405.985
Total	**173,194**	**865,364**	**1,389,763**	**2,088,006**	**2,873,061**	**4,292,768**

Source: Select-IDC, November, 1998

Table 5.4

Internet Users in Mexico

	1997	1998	1999	2000	2001	2002
Home	140.878	272.058	484.818	750.413	1.084.504	1.551.751
Government	13.855	30.555	47. 406	73.040	125.242	168.797
Education	141.814	302.406	369.031	528.185	599.217	1.005.615
Business	299.137	741.901	1.331.990	2.047.991	3.015.381	4.033.529
Total	**595,684**	**1,348,920**	**2,233,244**	**3,399,629**	**4,824,345**	**7,033,529**

Table: 5.5

Internet Accounts Paid in Mexico

	1997	1998	1999	2000	2001	2002
Home	55,416	108,318	191,619	296,592	428,637	612,711
Government	9,807	20,221	32,464	51,166	91,476	122,111
Education	31,898	21,600	26,552	39,495	45,927	80,096
Business	167,039	406,023	726,428	1,084,744	1,543,666	2,230,443
Total	**264,159**	**556,162**	**977,063**	**1,471,996**	**2,109,706**	**3,045,960**

Source: Select-IDC, November, 1998

Table 5.6

Percentage Distribution of Installed Capacity of PCs in Mexico

	1997	1998	1999	2000	2001	2002
Home	22	23	24	24	24	26
Government	8	9	10	11	2	12
Education	5	5	5	5	5	5
Business	65	63	62	60	59	58
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Select-IDC, October, 1998

An examination of the network card for the first semester of 1998 registered an increase in the market, which we had underestimated. This means that the number of PCs in LAN increased, due to last year's conservative projection.

The greater number of LAN networks affects the estimate of dedicated lines with access to Internet. The number of computers connected to a rural region is placed at approximately 1.5 million units, and it is expected that by 2003, this figure will total 3 million units.

One of the niches that will grow most is the installed capacity of standalone PCs at home. It is estimated that the compound growth rate will be around 21%. By the year 2000, home participation will be similar to the business sector, and it was estimated that by the end of 1998, 36% of the installed capacity of PCs would be found at home, whereas the business sector's participation would be 53%.

Services market with access to Internet: current status and estimates

Although the home represents the highest growth rate for the year 2000, the government and business sectors register the fastest growth rate for the total number of installed computers, especially those with access to Internet. The market average registers a 64% growth rate, while the government will have a compound rate of 71% and business 68%.

During the next few years, the institutions from the government sector will attempt to reduce the gap of Internet access for private institutions. However, this scenario does not seem altogether feasible because businesses will maintain their high growth rate, in view of their greater infrastructure of installed computers.

Table 5.7

Installed Capacity of PCs in LAN

	1997	1998	1999	2000	2001	2002
Home	0	0	0	0	0	0
Government	73,792	161.040	245.313	342.779	427.122	498.996
Education	49.068	94.729	129.112	163.228	185.705	20 ,915
Business	638.980	1.199.662	1.591.299	1.973.062	2.196.095	2.391.022
Total	761,650	1,455,431	1,965,724	2,479,068	2,808,923	3,097,933

Source: Select-IDC, October, 1998

Table 5.8

Services Market with Internet Access

	1997	1998	1999	2000	2001	2002
Home	53.668	104.403	184.623	285.871	413.145	591.143
Government	9.366	21.908	35.631	56.622	102.717	136.668
Education	34.484	56.635	71.498	103.969	120.997	194.724
Business	166.938	411.788	736.477	1.096.374	1.554.441	2.248.846
Total	264,456	594,734	1,028,298	1,542,837	2,191,298	3,171,381

Source: Select-IDC, November, 1998

Table 5.9

Distribution of Installed Capacity of PCs with Internet in Mexico, according to type of connection (percentage)

	1997	1998	1999	2000	2001	2002
Dial-Up	65	65	66	69	73	71
Dedicated	35	35	34	31	27	29
Total	100	100	100	100	100	100

Source: Select-IDC, November, 1998

Table 5.10

Distribution of PCs with Internet in Mexico, according to type of service (percentage)

	1997	1998	1999	2000	2001	2002
Home	20	18	19	19	19	19
Government	4	4	3	4	5	4
Education	13	10	7	7	6	6
Business	63	69	72	71	71	71
Total	100	100	100	100	100	100

Source: Select-IDC, November, 1998.

Distance Education in Argentina

Argentina is one of the Latin American countries most interested in incorporating distance education to meet the growing educational demands of its population. The institutions and organisations offering this option within their curricula and study plans are described below.

ESA Open Secondary School Program

After conducting an exhaustive evaluation on the need for providing continuing education to a significant sector of the population in the Misiones province who had only completed primary school, and reviewing the professional, technical, and economic possibilities for offering it via the SIPTED (provincial system for tele-courses and development), the ESA Open Education Program was launched in August 1997. Thus, ESA was transformed into one more area of the SIPTED, a decentralised agency with the objective of promoting, planning, and developing the implementation of audiovisual methods to improve and facilitate academic and extracurricular education for the Misiones community.

The beneficiaries of the Argentinean distance education system are young people and adults who were not retained by the formal educational system, inhabitants of rural areas, government employees, and convicts.

The programme is characterised by a semi on-site mode where the only requirement is attendance at the evaluation meeting. It implements a multimedia educational approach (printed material, audio cassettes, and video) and includes 73 units especially designed to fulfil the users' particular educational requirements.

SIPTED's strategic tools in these regions are radio and television, since the topography, as well as the high costs involved, make it difficult to use the usual infrastructure. The duration and frequency of the radio transmissions are tailored to the specific curricular requirements. The programmes are produced and recorded by the radio co-ordinator and curriculum specialists who use colloquial, non-rhetorical language designed to awaken the listeners' interest and hold their attention.

Television and video offer multiple possibilities, and ESA incorporates them as a complementary aid to the multimedia learning process. The province's open circuit is used for this purpose and, as of July 1996, a one-hour telecourse entitled "Teleducación: una mirada abierta" is transmitted every evening, from Monday to Friday. The materials complement the printed subject matter in each area. The video library includes its own productions along with those produced by other educational television services, thus meeting the needs of 350 related institutions.

Argentinean Air Force (FAA)

In 1972, Argentina's Air Force, fully aware of the need for providing its employees and their immediate families with the opportunity to study different levels of education when stationed abroad, designed and instituted the Distance Education Curriculum, approved via an agreement with the Ministry of Culture and Education.

It started as an institutional project to fulfill the needs of the Argentinean Air Force's employees and staff. Today, it provides a fundamental social and educational service that responds to the cultural requirements of every citizen who, for any number of reasons, is living abroad. This plan is available to Argentineans anywhere in the world where there is an Argentinean embassy, consulate, or cultural attaché. The headquarters are located in Buenos Aires, the Argentinean capital.

The distance education programme comprises two levels: primary and secondary school, and grants the approximate equivalent of a B.A. and commercial degrees.

Universidad Católica del Nortes (CED)

The Universidad Católica del Norte's (CED's) principal mission is to contribute, via its distance education programme, to the development of a university curriculum in order to efficiently attain the university's educational goals on regional, national, and international levels. The strategic objectives are the following:

- To develop distance education mode at the highest academic level, consolidate its own identity, and contribute to the development of society as a whole.
- To diagnose both current and prospective needs, on a national and international level, for training programmes, specialisation and recycling purposes in different areas.
- To collaborate with different units in the university itself for the production of non-resident academic courses and to provide the corresponding technological and administrative macrostructure required for their operation.
- To explore new media alternatives and valid materials for distance didactic communication and to promote exchange of views with other similar organisations.
- To improve the level of human resources and expand the CED's physical and equipment infrastructure.

Universidad de Belgrano

It is expected that by the 21st century, special skills will be the most important instrument in personal and institutional development. The University of Belgrano (UB), via the UBFED, submits an educational proposal that surmounts the obstacles of time and distance peculiar to a country as large as Argentina.

UBFED is a federalist concept with which the University of Belgrano proposes to meet the educational needs of the different local and regional realities by means of a distance educational programme. To this end, television is the most appropriate medium for reaching these sites, since it offers their residents the opportunity to improve and update their skills in different areas.

UBFED has the following characteristics:

- Multimedia material prepared by teams of Argentinean and foreign specialists, which includes printed matter, TV programmes, and comprehensive CDs.
- TV programmes designed and produced in the UBTV studios in accordance with the academic requirements of each discipline.
- Tutoring service via telephone, fax, and e-mail.
- On site meetings and final exams in different sites throughout the country.
- Academic year comprised of three four-month courses.

Universidad del Salvador

In order to reconcile personal and job needs for educational advancement with the interested parties' different and varied schedules, the Universidad del Salvador has implemented a flexible method of distance education. For the first time in the area of linguistics, the Vice-Rectorate of Research and Development's Office of Scientific Publications has programmed three non-resident workshops in written expression. It is aimed at students interested in improving their writing skills without neglecting their corresponding professions, studies, or activities.

The Universidad del Salvador offers workshops in spelling, punctuation, and composition.

Table 5.11

Degrees and Courses Offered by the Argentinean Distance Education System

Academic Level	Course	Institution
Basic Education	Open and Distance Secondary Education (ESA)	SIPTED (Provincial System for Tele courses and Development)
	Primary and Secondary School (B.A. and Commercial Certificate)	FAA (Argentinean Air Force)
Secondary Education	Two-year Technical School Technical Education and Vocational Training	FED (Universidad de Belgrano's Distance Education Department)
	Technical Education for the Services Sector	(CED) Universidad Católica del Norte's Distance Education Center
B.A.	University Education	SEADH (Hernandarias Open and Distance Education System)
	Vocational Training in Education Civil Engineering B.A. in Education	(CED) Universidad Católica del Norte's Distance Education Center
Postgraduate M.A.	Vocational Training in Education Educational Management Educational Evaluation Educational Psychology	(CED) Universidad Católica del Norte's Distance Education Center
Continuing Education Certificate Courses	Professional Upgrading Professional Upgrading in Strategic Management	FED (Universidad de Belgrano's Distance Education Department)
	Distance Education Programme in Dermatology (PREADERM)	UB (Universidad de Belgrano)
	Diploma in Management of Technical and Educational Units Diploma in Educational Evaluation Diploma in Family Counseling Diploma in Administration of Human Resources Diploma in Total Quality Management Diploma in Environmental Management Diploma in Public Relations Diploma in Conduct Training for Children and Adults	(CED) Universidad Católica del Norte's Distance Education Center
	Diploma in Management of Technical and Educational Units	FED (Universidad de Belgrano's Distance Education Department)
Courses	Televised course on New Technologies for Distance Education	UNA (Universidad Nacional Abierta)
	Open Certificate Courses Business Training Entrepreneurship and Creation of Small Businesses	FED (Universidad de Belgrano's Distance Education Department)
	Spelling Workshop Punctuation Workshop Composition Workshop	Universidad del Salvador

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These workshops can be joined any time during the year and offer personalised attention to the students, despite their absence. Although students are not present, everyone always has a teacher to guide them.

Literature teachers are directly responsible for these workshops and are always available to the participants to help them with problems that may arise. They may be contacted for consultations via mail, fax, telephone, or e-mail and, in certain cases, even personal interviews are also feasible. The flexibility offered tends to stimulate creative and reflexive skills in creating and correcting written texts.

SEADH (Hernandarias Open and Distance Education System)

The SEADH is the first of its kind in Argentina, along the lines of the great institutions dedicated to this particular educational model such as the Open University in the U.K., the Universidad Nacional de Educación a Distancia in Spain, the Universidad Estatal a Distancia in Costa Rica, and the Universidad Nacional Abierta in Venezuela.

SEADH was conceived as an innovative alternative to the traditional educational mode, attending to the demands for ongoing training and professional advancement required by modern society. Within this framework, the SEADH is a valid tool, not only for those contemplating a university education, but also for those whose family or work commitments prevent them from regularly attending the conventional educational centres and adhering to fixed schedules and calendars.

Distance Education in Cuba

Distance education as an alternative began in Cuba in 1994. With the introduction of e-mail, it has proved to be, without being a formally supervised process, an extremely valuable source of information and feedback. It has especially filled the needs of those living in remote areas where it is difficult to offer constant, conventional attention. The greatest challenges are updating, preparing, and developing these resources.

This mode of educational technology, initiated by the *cursos por encuentro* system, has been applied to secondary as well as to postgraduate courses. This is only a variation of the type of programme where many mid-level technicians have completed their B.A. degrees, with on-site activities taking place every two or three weeks. Audiovisual media are used and the study group has homework to do.

The following courses are taught in this programme:

- Training in the distance health programme
- Organisation and development in the Virtual University of Medical Sciences

At present, distance education in Cuba is sustained by incorporating data communications with the traditional non-resident model. Since no other interactive and methodological activities with the student can be substituted, it increases the possibilities for implementing this particular activity.

The structure of this university is comprised of the following:

- Its main headquarters: CENAPEM (National Center for Medical Advancement)
- INFOMED: the structure that allows for the development of this process
- ENSP: National School of Public Health
- CECAM: Center of Computer Application to Medicine
- CENAPET: National Center for Technical Advancement
- Medical Sciences Network
- 25 Schools, including Medicine, Stomatology, and B.A. degrees in Nursing

- 15 provincial centres for Academic and Professional Advancement (should be connected to the network by next year)
- Reference centre
- 4 national centres
- 4 medical schools
- 4 national research centres

Every five years, all health care professionals must accumulate a given number of academic credits and submit to a re-evaluation process which requires an effort on the part of the system to provide these professionals with access to these credits. Therefore, the use of distance education constitutes a decisive tool.

Table 5.12

Degrees and Courses Offered by the Cuban Distance Education System

Academic Level	Course	Institution
	Development of Human Resources for the Health Sector	CENAPEM (National Center for Medical Advancement)
	Virtual University Medical Sciences	ENSP (National School of Public Health)

Distance Education in Venezuela

Universidad Nacional Abierta

The programme offered by the Universidad Nacional Abierta forms part of the IESAD project (Innovation for Distance University Education for Latin America and the Caribbean) to train multiplying or innovative agents in distance education. It is aimed at professional teachers and related fields, interested in obtaining a general, updated perspective of open and distance education. It includes three courses:

- Basic principles of distance education
- New technologies for distance education
- Design of curriculum for distance education

Table 5.13

Degrees and Courses Offered by the Venezuela Distance Education System

Academic Level	Course	Institution
(Short Courses)	Innovators in Distance Education	UNA (Universidad Nacional Abierta)

Distance Education in Colombia

In some Central and South American countries, there have been significant breakthroughs in the field of distance education. A case in point is Colombia. In 1983, Colombia's legislation decreed the implementation of open and distance education.

The principal goals for Colombia's distance education programme are to prepare and train people without neglecting the traditional teaching methods. Students have access to personalised consultations and so they, too, can form study groups at the university level.

The idea is for students to change over from the traditional classroom, where all activities have a given value while neglecting the cognitive process and the mastery of certain skills. In this sense, they modify their concept of master classes by seeking greater interaction between the subject and the object. The motivating factor is the search for information and the incorporation of reading materials into the learning process. Furthermore, they learn to develop their special skills for research and value judgement purposes.

One of the main challenges confronting distance education models is the difference between each specialty. The distance education model has

not sufficiently perfected the axis of skills upon stressing the acquisition of learning itself (cognitive axis) and the socialisation of the students in regard to autonomous, responsible learning.

The purpose of education is to attain greater competitiveness in the students in every aspect, so that the student-teacher relationship is based on the intelligent, productive command of language, on theoretical references, and on the exchange of information to present existing problems and conceive their creative solutions. This process tends to create a spirit of co-operation through the network system to train academic, scientific, technological, cultural, and other types of organisational structures. It is also conducive to the development of critical and creative thought in every area of human knowledge. As well, it develops reflective skills and ethical reasoning in community life, democratic participation, emotional life, and the appreciation of what is aesthetic, cultural, and enjoyable.

The institutional educational projects and the academic government organisations will be in charge of instilling public awareness toward greater participation in the new educational culture.

Distance Education in Peru

In Peru, distance education presents several contrasts. Schools have installed computer laboratories and hired professional or university technicians to head them and teach computer courses. Specialised personnel with different pedagogical backgrounds have been hired to teach these courses, and their curriculum is defined according to the guidelines established by prestigious computer centres.

Many of these centres have become mini-computer schools that merely provide instructions regarding the use of professional software packages instead of adequately preparing teachers to impart regular courses with the aid of data processing techniques.

In Peru, only the Universidad de San Ignacio de Loyola has developed a project of this type. They have an agreement with a Mexican university that commercialises courses in Peru. Unfortunately, its high cost has transformed it into an elitist activity. Furthermore, only a very small percentage of the population owns a computer; this is a country that consumes special skills instead of producing them.

What must be done is to create policies for computer use in education and encourage their implementation, develop educational software materials in accordance with the needs of the country, or else, incorporate other applied technologies to education. Universities must agree to provide free service to certain sectors of the population as well as provide data for the network for this model to function properly.

Distance Education in Costa Rica

In 1977, the Costa Rican legislative assembly created the Universidad Estatal a Distancia (UNED). At that time, there were 29 university centres throughout the country, offering over 30 university degrees on a four-month basis. They had over 12,000 active students during each academic period.

A large number of young, recent secondary school graduates, homemakers, educators, workers, and others are only a few of the students interested in distance education courses. In every part of the country there are people eager for self-improvement and who, for different reasons, have not had access to formal education.

UNED also offers courses for foreigners; the only requirement is a secondary school diploma. And these are the countries that, in our judgement, represent present-day distance education in Latin America. As can be observed, the enormous challenges that must be faced demand greater efforts in order to provide greater social benefits.

APPENDIX 5.1:
Literacy in Mexico by Age Group

Population aged 15 years or more, total and able to read and write, per five-year age groups. 1990, 1992, and 1995 (Mexico)

	1990		1992		1995	
Age group	Total	Able to read & write	Total	Able to read & write	Total	Able to read & write
15-19 years	9.644.403	9.268.722	10.000.883	9.614.849	10.142.071	9.730.017
20-24 years	7.829.163	7.395.703	7.985.691	7.632.724	9.397.424	8.991.528
25-29 years	6.404.512	5.929.468	6.562.704	6.152.535	7.613.090	7.192.154
30-34 years	5.387.619	4.921.654	5.773.021	5.298.479	6.564.605	6.105.261
35-39 years	4.579.116	4.019.224	5.118.139	4.528.529	5.820.178	5.290.888
40-44 years	3.497.770	2.955.583	3.878.136	3.331.319	4.434.317	3.919.727
45-49 years	2.971.860	2.376.584	3.311.565	2.674.420	3.612.452	3.051.793
50-54 years	2.393.791	1.854.185	2.689.993	2.075.599	2.896.049	2.336.765
55-59 years	1.894.484	1.407.978	2.375.211	1.655.760	2.231.897	1.725.085
60-64 years	1.611.317	1.119.088	1.991.915	1.337.770	1.941.953	1.415.173
65 years and over	3.376.841	2.105.878	3.761.990	2.237.256	4.027.690	2.619.770
Total	49,610,876	43,354,067	53,449,248	46,539,240	58,681,726	52,378,161

Source: INEGI. XI Censo General de Población y Vivienda, 1990; Encuesta Nacional de la Dinámica Demográfica, 1992 and Estados Unidos Mexicanos. Conteo de Población y Vivienda 95. Definite results. Basic tabulations.

Enrolled students at the beginning of the course, according to school level 1990/91–96/97 (Mexico)

(Thousands)

School Level	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97
Preschool	2.734.1	2.791.5	2.858.9	2.980.0	3.092.8	3.170.0	3.238.3
Primary	14.401.6	14.397.0	14.425.6	14.469.5	14.574.2	14.623.4	14.650.5
Job Training	413.6	407.3	402.6	391.0	428.0	463.4	498.8
Secondary	4.190.2	4.160.7	4.203.1	4.341.9	4.493.2	4.687.3	4.809.3
Technical/a	378.9	410.9	410.2	406.5	407.0	388.0	383.8
High School	1.721.6	1.725.3	1.767.0	1.837.7	1.936.4	2.050.7	2.222.3
Teacher Training/b	109.0	104.8	111.0	120.2	137.3	160.0	188.4
B.A.	1.097.1	1.164.0	1.144.2	1.192.7	1.217.2	1.295.0	1.329.7
Postgraduate	45.9	47.5	51.5	55.1	66.0	77.8	94.3
Total	25,092.0	25,209.0	25,374.1	25,794.6	26,352.1	26,915.6	27,415.4

a: Technical level
b: B.A. in Teacher Training

Source: INEGI, based on data provided by SEP.

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6 European Trends in the Virtual Delivery of Education

DR. ROBIN MASON

Issues and Perspectives

The European Union, through its various research and development funding initiatives, has been a major driver of educational change in Europe over the last 10 years. First through the DELTA telematics programme, and now through a wide range of programmes such as Fourth Framework, Leonardo, Socrates, and Adapt, a large number of projects have been initiated across Europe. Some of these investigate the technology backbone, some the pedagogical approaches; others set up European study centres, yet others develop software and courses. All of these are a necessary part of the movement towards virtual teaching and an integrated environment for pan-European delivery of courses.

The rush by traditional campus-based institutions into distance education has been headlong in North America over the last 10 years or so. The last five have seen this phenomenon in the U.K. and Scandinavian countries. My survey of other European countries leads me to hypothesise that, as the power and prestige of the traditional old universities are still intact, they may leapfrog over the interim step of distance education, and go straight to modest forms of virtual education. At this point, these modest forms usually involve a connection with a university abroad (e.g., in the United States).

It is clear that the new growth area in education is the lifelong learning market. And although the rhetoric about virtual education is that it will extend to the disadvantaged, the remote, the housebound, and the unemployed, those who are signing up for virtual education are the advantaged, the upwardly mobile, the "over-employed" (i.e, those who are already incredibly busy), and the well educated. There is evidence from practitioners that virtual education is more appropriate and more successful for the advantaged learner: one who is motivated, has good learning skills, and has easy access to technology.

Before focusing on those issues peculiar to European attitudes and approaches to virtual education, it is necessary to acknowledge the similarities of the concept of the virtual university in Europe compared with attitudes elsewhere. The degree of over-excitement about virtual education, the overuse of the term "virtual university," and the expectations of its cost-saving properties and messianic solution to problems in education are as undiluted here as elsewhere. For example, the search term *virtual university and Europe*, on the Web search engine AltaVista gives well over 100,000 hits, although none of what I consider the front runners in virtual education actually appear in this list. So there is much posturing and unsupported use of terms with little substance behind the rhetoric.

In turning to the unique aspects of the European scene, by far the most notable is the mix of languages. Virtual education is "linguistically sensitive," making even the concept of a pan-European course fall at the first stumbling block. English is the *de facto* common language for much cross-country online teaching in Europe, but this practice inevitably excludes many southern European participants. A number of models have been tried on EU-funded projects to handle the language problem: teaching material in English, but tutoring in the local language; simultaneous translation of video-conference presentations; focus around three central languages. But it is evident from the examples given below, that many of the virtual initiatives remain within one country, use English only, or partner with same language countries outside Europe.

There are also cultural difficulties with pan-European courses. While many centre on linguistic misunderstandings, others operate at a more subtle level. They are particularly evident in online text-based discussions where the intricacies of human interaction highlight differences in modes of address, approaches to collaborative work, tone of voice, and attitudes to assessment. Of course, these differences can be found in teaching situations whether face-to-face or online anywhere in the world, as all countries become more multicultural. In Europe, they are the norm rather than the exception

The differences in pedagogical approaches to education are equally as daunting a barrier to virtual education as is language. Student-centred, constructivist notions about learning hold sway across mainstream educational providers in the U.K. and northern European countries (The Netherlands, Denmark, Sweden, Finland). Traditional, teacher-centred transmissive approaches still dominate thinking in France, Germany, and the Latin countries. The notion of virtual education can and does encompass both approaches and various technologies support one approach more strongly than the other. For example, video-conferencing replicates the lecture and is appropriate to a teacher-centred approach, whereas text-based asynchronous messaging supports a student-centred approach. Just as so many technologies have converged on the Web, so both pedagogies are supported by it as well: closed-loop teaching material with multiple guess assessment on the one hand, and resource-based, interactive and collaborative courses on the other.

The deregulation of the telecommunications infrastructure in Europe has been 10 to 15 years behind that of North America, and that has made a big difference in the development of virtual education models. The high cost of local calls, much less long distance ones, in Europe has been a significant disincentive to online teaching. The U.K. has led the way in this deregulation, just as it has in all forms of online and virtual education. Other countries are catching up quickly and the new growth area is expected to be in Germany with the anticipated lowering of call charges. In eastern Europe, the telephone infrastructure has been too poor to support home-based access to the Internet, and in any case, distance education still has the reputation of being second best there. Through the Phare programme *www.phare-pcu.bg* the EU is now funding several initiatives in various eastern European countries, but most are in the "awareness raising" stage.

Finally, the system of credit transfer in North America has never existed in Europe and is a significant barrier to some forms of virtual education. Students need, on the whole, to complete all of their degree with one institution, although there are now EU-funded schemes to physically go to other institutions for periods of up to a year.

Training is the one sector of learning that cuts across many of these barriers in Europe. Companies with a global or international presence have initiated training schemes in virtual environments and, with some exceptions, could be said to be

leading the way in virtual teaching in Europe. The most notable are still in the information and communication technology (ICT) and telecoms field, but others are in the planning stages.

Primary and secondary education has also received heavy funding from EU research and development monies. In the early days, this involved simple link-ups between schools to exchange e-mails about "life in my country." Recently much more ambitious schemes have emerged, usually funded by national governments to provide computers and network access in schools.

Training for teachers has also finally been recognised as a major barrier to the development of the technology and every European country has schemes in various stages of implementation to increase teachers' ICT skills. Italy, Germany, Sweden, and the U.K. are prominent examples. One of the most interesting EU-funded initiatives is Netd@ys which aims to promote European school projects on the Internet, encourage public and private, partnerships, and support the establishment of a European SchoolNet.

Current Examples of Virtual Education in Europe

Two major types of examples of virtual education can be examined. The first consists of examples of virtual education in which existing providers of learning opportunities are moving to ICT-based provision of courses directly to students. The second type encompasses organisations that have been created through alliances and partnerships to facilitate teaching and learning. In some cases they commission courses where none exist. Although this kind of umbrella organisation existed before the ICT revolution, there is no doubt that many more initiatives have sprung up in the last few years.

Direct providers

- *NKI*, centred in Oslo and specialising in computer and ICT subjects, has offered online distance education courses since 1987. NKI Nettskolen is a new initiative designed for distance students to be able to do all their communication online. The philosophy of NKI Nettskolen has always been to offer programmes independent of time and space through a system that facilitates flexible communication for administrative, social, and teaching purposes.

  Thirty courses have now been transferred to the Web with the course contents, which used to be in print. Although NKI will gradually move towards a curriculum designed specifically for the Web, in the meantime these courses reflect the "horseless carriage" approach to virtual teaching: materials produced for one medium are poured into another with minimal accommodation to the unique features of the new medium.

  NKI is convinced that flexibility is the central feature of the marketability of their courses. Students need to be able to register for courses when they choose, study when and where they choose and submit for examination when they choose. This use of the Web is compatible with such an approach.

  Web site: *www.nettskolen.com*

- *U.K. Open University (UKOU)* has always focused on accepting students without regard to previous qualifications, rather than on choice of registration and examination. In fact, pacing of workload through assessment, face-to-face meetings, and tutor support have been longstanding principles of its approach. As the market changes, some of these "sacred cows" are giving way to online methods, modularised courses, and reductions in face-to-face tutoring.

There are two ways in which the UKOU might be said to have entered the virtual market: in the global spread of its course delivery, and the movement towards online tutoring and administrative support for courses. It has not, nor does it foresee, putting the content of courses on the Web. Print is cheaper, provides better quality, and is more flexible; putting large amounts of material on the Web merely transfers costs to students.

The UKOU has various arrangements with partners and franchised institutions in a vast number of countries. In some cases, course materials are merely sold to other institutions, but mostly UKOU retains a tutoring, marking, administering, or awarding role in the delivery of courses in the local country. In several eastern European countries, materials have been translated, and in some countries, materials have been adapted, shortened, or "localised" to fit the needs of the purchasing institution.

The UKOU has over 7,000 students on continental western Europe and these, along with 32,000 U.K. students, access the Internet for tutoring and other services. These numbers still represent only about one-fifth of the total student population. The main barrier to further spread of online tutoring is lack of computer and Internet access by the student body. Research points to the fact that disadvantaged students, females, and those in arts and social sciences are put off from registering by the requirement to have access. The UKOU policy is to increase this requirement in line with evidence of home ownership.

Web site: *www.open.ac.uk*

- *British Aerospace Virtual University* was created in 1997 and launched in 1998 to provide a coherent strategy, focus, and alignment to the design and delivery of learning, development, and research programmes across the whole company. While the ultimate aim is to secure competitiveness and enhance business performance, the interim purpose is to move towards a culture where individuals are encouraged to manage their own learning. Online delivery of training and professional updating will be a significant step towards this goal, unlike the current face-to-face, "stand-up" training it replaces. British Aerospace is in the process of making partnerships with various education and training providers to deliver part of the required curriculum. ICT training, for example, will be carried out in part by a suite of self-managed online learning packages (CD-ROMs) which staff access from special training facilities set aside within British Aerospace. Other partners include various universities, such as the UKOU, which will provide courses, administrative know-how, and train the-trainer materials.

  As one of the most visible "corporate universities" on the European horizon, this one is notable for the way in which it puts curriculum, organisational transformation, and staff training before technology and hype about virtual education.

  Web site: *www.bae.co.uk*

Virtual Schooling

Most European countries are working towards a more technologically driven school system in which students are provided with more individualised learning, better Internet and computer skills, and increased interactivity both within their countries and around the world. The extent to which this is happening across Europe is largely contingent on the availability of resources and the level of commitment of both governments and partners from the private sector. Three examples include Denmark, The Netherlands, and the U.K.

- *Denmark:* The Danish government is funding an ambitious programme of training and skills development in teachers and students at all levels. For example, Schools on the Internet is a project inviting students to communicate both nationally and internationally and to access a range of appropriate resources. The goal is to have all lower secondary and private schools in Denmark connected to the network by the year 2000.
- *The Netherlands:* Information technology has been integrated into the main policy themes for primary and secondary education in The Netherlands. In primary education, the focus is on the computer as an educational tool and as a medium for teaching and learning. At the secondary level, the emphasis is placed on giving the student greater responsibility while the teacher takes on a supervisory role. For example, the Scharnier-Project Oost Brabant project, subsidised by public funds, brings together both schools and higher education establishments with the aim of facilitating pupils' transitions from secondary to higher education. The network consists of 27 schools and five institutions of higher learning. The initiative assists pupils to adapt to autonomous learning and the changing role of the teacher.

  Web site: *www.pth.nl/scharnier/homepage.htm*
- *The National Grid for Learning* is the U.K. government's recent initiative to improve access to ICT by all schools in the primary and secondary sector. It provides resources for use by teachers as well as materials for direct use by students. It also caters specifically for home schoolers. It offers communication facilities for teachers to exchange ideas and for students to communicate within and across schools. It is Web-based, but additional features include some use of ISDN. The Web site for the National Grid is *www.ngfl.gov.uk*.

Connected to this initiative is a British Lottery-funded project to provide ICT training for all primary and secondary school teachers in the U.K. Using the National Grid and the equipment and network it provides, teachers will be offered a certificated programme of training geared specifically for their curriculum areas. In addition, head teachers in England and Wales are currently being offered a programme of leadership training, which includes a Web-based ICT component to enable them to understand and manage the spread of ICT in their schools.

Two examples of early programmes include the following:

1. *Students across Europe:* Monkseaton Community High School, Whitley Bay, has undertaken a project on the development of modern language skills, with pupils communicating with their French, German, and Spanish counterparts through the use of wideband (ISDN2) and narrowband technology, including video-conferencing links. The benefits have been considerable and include improved results at A level, improved motivation of pupils, improved conversational skills in languages, and development of cultural understanding. The Web site is *www.ncl.ac.uk/Schools/zdclou*.

2. *Superhighways Teams Across Rural Schools (STARS):* Eighteen small primary schools, with four teachers or fewer, and two secondary schools took part in this project based at Northern College of Education in Aberdeen and Dundee. The project aimed to enhance provision for able pupils and made use of electronic communications technology, including a conference system. There was a wide range of benefits for

able pupils, including increased confidence and enthusiasm, opportunity to share ideas with high-ability pupils in other schools, new awareness that peers from other schools could out-perform them, greater attentiveness to the needs of others, and taking greater responsibility for their own learning.

Education brokers

- *EuroPACE 2000* is a trans-European network of universities, enterprises, and organisations with an interest in distance and continuing education and training. EuroPACE 2000 has approximately 60 member organisations all over Europe, 45 of which are universities. By using various models, EuroPACE 2000 aims to demonstrate and develop the potential of telematics for the European universities and for the lifelong learning market generally. In this sense, it promotes itself as contributing towards a virtual university of Europe.

  Using EU funding, EuroPACE continues to experiment with ISDN-based videoconferencing and satellite-based interactive television. These are the technologies it uses for its "virtual university campus and class" model. For its networked learning-on-demand model, it promotes the Internet and particularly the Web. Its third initiative centres on a European Ph.D. programme.

  This is an initiative that is always in need of funding and seems reliant on EU grants. In short, after more than five years, it has still not moved past the "funded experiments" stage.

  Web site: *www.europace.be*

- *Clyde Virtual University (CVU)* is funded by the Scottish Higher Education Funding Council through its use of the Metropolitan Area Network Initiative. It is dedicated to the delivery of Internet-based multimedia learning materials to students at institutions connected to the ClydeNet MAN. Led by Strathclyde University, CVU is a collaborative project involving four additional participating institutions in the Clyde region.

  One of the main aims of the CVU is to convert existing pieces of courseware including CAL packages originally developed in authoring software such as Toolbook and Authorware, lecture notes, and graphics in various formats, along with its own assessment engine, for delivery over the Web. In short, the purpose of the collaboration is to use the broadband network put in place throughout the area to deliver platform-independent multimedia software via the Web. The greater bandwidth of the MAN facilitates the speedier download of graphics, sound, and video files.

  A graphic designer was employed to create a futuristic front-end to the Web site, adding to the professional image of the CVU and helping to ensure its acceptance among students and staff across the ClydeNet. The thinking is that a visually appealing site helps transform a simple structure of textual menus into a more immersive environment.

  Between May 1996 and January 1997, over 1,000 students and staff had registered to use CVU. Evaluation studies show a very favourable response from users.

  This initiative falls into the category of "extension of existing campus resources." However, CVU plans to produce several complete courses delivered entirely on the MANs. In this sense, it contributes to the further convergence of the old division between traditional campus and distance education provision.

  Web site: *www.cvu.strath.ac.uk/index.html*

- *Virtual University Enterprises (VUE)* is a division of National Computer Systems and specialises in ICT testing and training infrastructure services. It has engaged a global network of electronic testing centres to offer exams for individuals seeking certification from Microsoft, Novell, and Sybase. It also provides real-time course registration and training administration services via the Internet. VUE is headquartered in Bloomington, Minnesota in the United States, but has its European centre in The Netherlands.

  VUE's Web-based training information system provides access to a database of ICT training sources around the globe. The company works with large corporations to customise its services. In essence, VUE enables corporations that need to train a variety of employees in a wide variety of skills, to create their own "virtual university" accessible only by their own employees, with VUE helping to manage the corporation's training needs.

  This is an example of the subsidiary consultancy services, which the advent of virtual teaching and training has spawned. Another example is the "bundling" of Web-in-a-box software and expertise to put a university online.

  Web site: *www.vue.com*

- *University for Industry (UfI):* The focus of the newly launched U.K.'s University for Industry is education and training for the workforce, especially for those people who have not had the job-related education and training that would allow them to achieve their potential in the work place. Enhancing training opportunities for those in small-and medium-sized enterprises is a special concern. Degree-level education is not UfI's main task and market research has shown that its title, apart from being a misnomer, does not resonate with those it plans to target.

  Whether as UfI or under another name, the new body will not be a provider of courses, an accrediting body, or a funding council. It aims to provide information through a help-line (called Learning Direct), to commission ICT-based open learning materials where necessary and to facilitate the development of a national network of learning centres.

  The UfI design team is convinced that there would be a high demand for short open learning courses, offered with frequent start dates, covering key transferable and work place skills. It also believes that new delivery technologies and a new style of local learning centre would attract more people to study.

  However, the team also knows that turning latent demand into active demand requires long-term persistent action, not just from the government but from a wide range of partners. The role of UfI will be to provide leadership, to promote lifelong learning and to co-ordinate the infrastructure of information, guidance, and support. In short, it will be the catalyst to draw key partners together.

  Web site: *www.dfee.gov.uk/ufi*

- *University of the Highlands and Islands Project (UHI)* is another U.K.-based initiative that draws together existing educational providers in the highlands and islands region of Scotland. Like the UfI, the new structure will act as broker, information provider, catalyst and, in some cases, commissioner of new courses from local providers.

  Pilot courses are now going ahead after a long consultation process with existing institutions in the region. Extensive telecommunications infrastructure has also been put in place, allowing ISDN video-conferencing even to the remote islands, as well as Internet access and provision of equipment.

This initiative bears some resemblance to the Western Governors University (WGU), although on a smaller scale. WGU is an American virtual university initiative designed to provide ICT-based courses and degrees from existing universities. The intention of the University of the Highlands and Islands Projects, like WGU, is to increase access to education, reduce costs and barriers, exploit new technologies for delivery, and share resources across existing providers.

Web site: *www.uhi.ac.uk*

Other Initiatives

Other initiatives call themselves virtual, but in most cases they are smaller or less developed than those listed above. The following examples are intended to give a flavour of the quantity and quality of projects currently taking place or in the planning stages.

- *Virtual University of Hagen:* The Fern Universität is a distance teaching institution in Germany. This virtual university initiative is implemented with the Web as a central component combined with tools for communication and co-operation. It includes speech and low-cost video. The distance teaching history of the organisation has led to an emphasis on users' needs rather than the lecture room paradigm. Furthermore, the approach emphasises users rather than students, to acknowledge the intertwining of studying and working. While much of the thinking for the project has been done, and an extensive Web site describes the project, the team recognises the long-term nature of the project. Not only is the technical platform ambitious, but it integrates a multitude of different technologies and software. The transformation of the current teaching material into appropriate digital versions will require substantial resources. Furthermore, the approach requires fundamental organisational change as well as new thinking and training of the current university staff.

  Web site: *www.fernuni-hagen.de*

- *Deutsche Telekom (DT)* launched its Global Learning range of services in 1997, but little activity has transpired since then. DT realises that today's telecommunications companies are no longer simply carriers but intelligent purveyors of information. One of their aims is to target "individualised learning." They note that internal training and development is moving away from the use of training centres towards individual, network-based methods that offer the trainee more choice, flexibility, and personal feedback from the tutor. Working through partner providers, they intend to offer computer-based training and multimedia applications for employees accessible through their Global Learning system. A tutor will be available for e-mail questions and correcting homework, and through a testing room, the trainee can take exams at any time. They also plan a Global Learning Institute in which professional consulting will be available for transferring conventional basic training and further training to new learning systems and for training tutors, course developers, and administrators. The Institute will have a virtual faculty consisting of experts from around the world, pooling their expertise to provide individual answers to queries, small, tailored courses, and introductory seminars.

  Web site: *www.dtag.de/english*

- *Cafe Mondial* is another EU-funded consortium of universities, colleges, and private institutions providing professional training via the Web. The courses consist of Web pages, resource packs, and online tutoring. Currently

they have 20 courses with 900 students studying subjects like ICT, Web design, Languages, Arts, Music, and Health.

Web site: *www.cafe-mondial.de*

- UNED is the distance teaching university of Spain. It has moved to provide virtual resources for students online. For example, it has a virtual library, bookstore for ordering, and optional online tutoring.

  Web site: *www.uned.es*

- *University College Dublin (UCD)* has been involved in the EU-funded development of the Web front-end now called TopClass. UCD exploits this technology to offer adult education courses in ICT and the liberal arts.

  Web site: *www.ucd.ie/~delitti*

- *Virtual Biotechnology University:* Marine scientists at the University of Maryland Biotechnology Institute have joined a consortium with University of Goteberg in Sweden and the University of Bergen in Norway. Funded by the Swedish Wallenberg Foundation and called VIRTUE, the overarching goals for the new university focus on marine biotechnology, both teaching and collaborative research. Using innovative but appropriate technology, they intend to enable both developed and developing countries to address environmental issues. Real-time, full-duplex interactive video is used for collaboration among the three sites, and VIRTUE plans to develop Web-based learning materials.

  Web site: *www.mdsg.umd.edu/~jacobs/virtue/about/oversight.html*

- *Cyberversity Academy of European Law* provides all its courses through a special multi-phase learning approach, totally Web-based. Self-structured learning materials using Web resources are supported by tele-teaching and other multimedia educational technologies. Extended programme offerings in Business Administration, Management, and Society Studies will be initiated in early 1999 in co-operation with affiliated universities.

  Web site: *www.aer-academy.de*

- *Helsinki University:* Using "easy" technology, distance learning in Finland has to be accessible by modems from homes. Consequently an open learning environment is being developed where it is possible for anyone to study, get guidance and office-services, and communicate with peer students. Helsinki University is the largest university in Finland and is acting as the central point for the development of courses. The number of courses is increasing all the time, although most of the courses are on a basic level. All Finnish open university courses have been collected onto one database on the Web where you can also find all the virtual or distance education courses arranged by Finnish open universities.

  Web site: *http://avoin.helsinki.fi*

- *Marriott Virtual University:* The International Management Centre has an arrangement between the Marriott hotel chain and Oxford Brookes University in the U.K. where Oxford Brookes provides virtual training in hotel management for Marriott staff internationally.

  Web site: *http://imc.org.uk/mvu*

Summary

The conclusions to be drawn about the growth of virtual teaching in Europe can be identified by specific issues: technology infrastructure limitations, financial impact, human resources impact, learner and teacher acceptance, the reaction of conventional institutions, and demographic characteristics.

Technology infrastructure limitations

The southern and eastern European countries in general lack a telecommunications infrastructure that allows any kind of virtual teaching other than through study centres. That is, home access is out of the question, both because the network is not robust and the ownership of personal computers is not in place. Where these limitations do not apply and particularly where there is deregulation and, therefore, price reductions, there is much greater use of virtual teaching and learning from the home environment (e.g., in the U.K., The Netherlands, Sweden, Finland, and to a lesser extent, Denmark).

Financial impact

It is well known that funding initiatives by government, whether local or pan-European, may be necessary, but are certainly not sufficient to establish technology-based teaching. The rush for funding and the nature of the funding limitations (e.g., necessity of collaborative projects, reporting and accounting procedures, project outcomes stated in the bid outline, etc.) tend to facilitate stitched-together projects and funding dependency. They are not the stuff of long-term, sustainable initiatives that build allegiance from the grass roots.

The funding requirements of virtual projects span the gamut from small, course-based initiatives to complete universities. The EU has frameworks for supporting this whole range. In some sense, money is not the problem: sustainable projects that meet real needs are in shorter supply. The number of EU-funded projects that are still in operation three years after the money has stopped are certainly in the minority.

Human resources

After some years of technology-led projects, the training of teachers is finally catching up. There are major training initiatives across all sectors of education. However, in those countries that are in the forefront of virtual teaching (e.g., the U.K.), there is a severe workload issue that needs attention. Many academics are under great pressure to produce research results at the same time as deliver courses to vastly increased numbers of students. While virtual teaching may have some answers to this squeeze, the long-term exploitation of teaching staff is not sustainable. Support staff are now in greater demand than teaching staff in some places, and those with ICT skills can command a high salary.

Learner acceptance

Most evaluation studies of virtual courses show that students are enthusiastic about technology-based teaching. Of course, we are in the early adopter phase and these students are usually self-selected in some way. One of the interesting facts about technology-based virtual teaching as opposed to traditional distance teaching is that it is *less* flexible. (Traditional distance education in Europe consists of print-based materials plus tutorials in local study centres). Reading from screen, having to study near a computer with network access, and certainly carrying out collaborative work online—all these factors make a course less flexible than reading specially prepared study texts. Nevertheless, students welcome the opportunity to develop ICT skills, and the brightest and most independent learners (say the top third) enjoy and benefit considerably from the kind of constructivist approaches that virtual courses often use.

Teacher acceptance

Just as the early adopter students are technology supporters, so are the teaching staff who pioneer virtual methods. Many of them despair of the Luddite approaches of their colleagues who complain about lack of rewards, overwork, and disbelief in the value of non-contiguous education. Organisations that impose technology-based

teaching from the top incur greater wrath and stonewalling. When the context becomes serious (e.g., closures threatened; promotion or rewards offered etc.), Luddites seem to work an amazingly quick volte face.

Acceptance of conventional institutions

While distance and virtual education has won many converts in Europe, the conventional universities still take little notice. Perhaps this is appropriate. Most of the institutions that are "hungry"—those that are less well-established, less elitist, less well-funded—are actively considering their options and wondering where and how to enter the market. In the U.K., the Open University used to have the distance education market to itself. Within the last five years, with many of the newer universities offering some form of distance education, competition has become intense. Most other European countries have some version of an open university, but competition from traditional universities is not yet significant.

Demographic characteristics

While most of the excitement and rhetoric about virtual education is that it will serve the disadvantaged, the remote, the unemployed, and the lifelong learner, in reality, the early adopters are the opposite: employed, urban, well educated, and well off. Some initiatives are specifically targeting the former category (e.g., the University for Industry). It will be interesting to see how successful they are.

7 Virtual Institutions on the African Continent

MR. VIS NAIDOO & PROF. CASPER SCHUTTE

Introduction

The use of modern educational information and communication technologies (ICT) in the construction of new education paradigms has irrevocably changed the way in which teaching and learning will be done in the future. This is true for both the developing and developed worlds—although the rate of deployment of new technologies is lower in developing countries.

There are, however, some fundamental differences in the way in which educational change towards technology is approached and implemented between the more advanced countries and the developing countries. For developing countries, the primary emphasis is always upon acquiring infrastructure, such as telecommunication infrastructure, hardware, software, and networks. Only then can attention be given to educational and training needs. Key to these needs is the training of educators and users (learners), the development of appropriate content, and the maintenance of the educational technology infrastructure.

This fundamental change mentioned above is not only important for tertiary educational institutions, but for all education and training at lower levels, ranging from adult basic education and literacy, right up to degree levels. It is especially important to note that it also affects all training in industry and commerce.

Institutions that make use of modern information and communication technologies in their teaching and training can be said to engage in "virtual teaching activities" and can be classified as "virtual institutions." Their activities range from the purely "contact" type to purely "distance" type, as well as the various so-called "mixed mode" types. However, all such virtual activities in Africa are limited to the experimentation level or in the initial stages of implementation because of infrastructure problems, which, in turn, are caused by lack of funds and expertise and, in some cases, political instability. The problem is sometimes further compounded by a lack of vision, knowledge, and appreciation of ICT in top governmental structures.

This report focuses on the following aspects of the transformations experienced towards virtual education institutions:

- Infrastructure problems in Africa
- Networking and the Internet
- Satellites and their footprints
- Some examples in a technologically advanced country, such as South Africa
- Some examples elsewhere in Africa, notably the African Virtual University, and their successes and failures

It does not examine the problems caused by political and other instabilities. While they are very important, they need a separate study.

This survey of African virtual institutions includes the following kinds of contact, distance, and mixed mode institutions:

- Tertiary institutions such as universities and technikons (technical universities)
- Teacher training colleges
- Schools
- Industrial training institutions
- Commercial training institutions

Since the development of the Internet as a possible teaching tool is fairly recent, it seemed unfair to exclude some reference to those institutions that are in a process of internal change, or intend to make such a bold move in the near future. The same applies to those institutions that are running pilot experiments to give them an opportunity to make a judgement about costs and effectiveness. Some of these institutions are, therefore, also included in this report, but are clearly identified as being in the process of "virtualisation."

The Central Concept of Networks within ICT

Central to the change in educational pattern towards virtual education and training all around the world is the concept of network. The term network is very broad and refers to, among other things, the following kinds of networks:

- A Local Area Network (LAN) within a computer or PC laboratory in which a central server links all the computers for teaching and other purposes.
- One or more LANs within an organisation for the purpose of academic administration or for education and training purposes. These LANs can be linked together; they need not be localised and can indeed be distributed over a particular geographic area.
- One or more Wide Area Networks (WAN).
- An electronic network (Internet), spanning the world, linking millions of PCs and other computers together to form a single massive information system. The Internet has various services, such as the World Wide Web; e-mail, file transfer protocol (FTP) activities; Gopher activities; Internet search engines to ferret out required information from the millions of sites; "see-you-see-me" Internet video-conferencing; and Internet telephony.
- Audio- and video-conferencing sites linked by ISDN and other data channels, including satellite data links.
- Interactive or non-interactive teaching sites linked by TV and/or radio transmissions using either land-based transmission or satellite transmission types.
- Community telecentres and other electronically linked entities.

The term networking is also sometimes used to refer to the linking of expertise and knowledge acquired at different places to improve the level of performance of the whole community of individuals that networks.

The Confluence of Technologies on the Internet

It is interesting that all the different modern telecommunication technologies in the above list of networks seem to be at a confluence on the Internet. This is forming a very strong driving force, since the bandwidth needed is becoming available.

Massive amounts of research and development funding are at present channeled into the Internet, together with all its services. The developments that occur, or are confidently predicted

to occur very soon, are rather breathtaking and indicate that educational authorities in all countries should take a hard look at their present methodologies. In fact, what is needed is a scientifically based study of various future communications and teaching scenarios and strategies. This is especially true for the developing countries.

The Internet and education and training

The Internet has become such a force in any modern information-oriented society that it is not a question anymore whether the Internet can be used as a teaching tool. The use of the Internet in education and training is taken for granted. The question that needs to be answered is this: How can the potential of the Internet be maximised for the benefit of teaching, training, and learning, especially in a developing country?

This point is, unfortunately, still missed by many education authorities and governments that continuously ask for "proof" that the Internet will benefit education and educators. Mr. Bill Gates recently said, "The Internet is like a tidal wave, drowning companies that don't learn to swim in its waters." And it must not be forgotten that education is also an industry—maybe one of the biggest in any country, since some developing countries spend up to 20% of their total annual budget on education!

To summarise, the Internet is becoming central to the concept of virtual teaching. The research for this report concentrated on locating educational, teaching, and training services offered on or via the Internet. These services may be either educational or administrative, or both. However, although the main area of investigation of this report is Internet related, it also includes many examples of non-Internet-based networking activities, such as educational videoconferencing.

Networks and other infrastructure in Africa

Unlike many countries of the world, Africa continuously struggles to procure infrastructure. Once obtained, there is a struggle to hold on to it and to service it and its relevant software. Then there is the struggle to provide infrastructure to more than just a small part of the population. Only when this ideal state has been reached can full-scale implementation of educational technology and its use begin.

As noted earlier, this report acknowledges this, and gives some attention to the existence of infrastructure on the African continent, with special reference to networks and the Internet on the one hand, and terrestrial and satellite communication technology on the other. Understanding these developments is of primary importance to any study on virtual educational institutions.

ICT in Africa

Each country has its own telecommunications company, responsible for the backbones and networks, as well as for linking to other countries. In addition, there is international collaboration across the continent for undersea cabling. Many international companies own telecommunication satellites, and many of them have footprints over Africa.

A sophisticated submarine cable project will provide a telecommunications superhighway via Africa. This is the South Africa-Far East (SAFE) and Southern Africa-Western Africa (SAT3/WASC) submarine cable system originated by Telkom South Africa, Telecom Malaysia, France Telecom, and Mauritius Telecom. This cable system has the intrinsic ability to propel most of Sub-Saharan Africa into the next millenium. The project installs a state-of-the art optical fibre cable with very large bandwidth that will be fully operational by the year 2000. When finished, it

will provide an additional route between Europe and Southeast Asia. Extending the cable to include east African nations is a real possibility which the investors are seriously considering.

This cable will eventually link 11 countries on the African west coast via Portugal and Cape Town with India and Malaysia, and the rest of the world. The SAT3/WASC link was initiated in May 1997 and now links Telkom SA, Angola Telecom, OPT Benin, Cote d'Ivoire Telecom, Ghana Telecom, Cameroon Intelcam, OPT Gabon, Liberia Libtelco, Senegal Sonatel, Niger Sonitel, Togo Telecom, Namibia Telecom, and Nigeria Nitel. On the east coast, Mauritius and Réunion are also connected.

The entire external infrastructure is, or will soon be, in place to give Africa all the Internet connectivity it wants. The main problems to connect within individual countries, or groups of countries, that are landlocked.

Internet Connectivity in Africa

The challenge

One of the main communication and information channels of the present is the Internet, and this will be even more important in the future when the predicted confluence of the various technologies takes place. It is, therefore, of the utmost importance that Internet connectivity takes place in Africa, especially in the educational community.

The 1995 World Bank Report, "Increasing Internet Connectivity in Sub-Saharan Africa: Issues, Options, and World Bank Group Role" has this to say about the Internet and Africa (*www.worldbank.org/aftdr/connect/incrint.htm*):

> The development of computer networking in Africa presents the World Bank with a unique opportunity to make a major contribution to Africa's current and future development. At the same time, the World Bank will be able to advance its strategic objectives in the areas of donor co-ordination, client consultation, capacity building, decentralization of activities and decision making, and private sector development.
>
> The information revolution is being driven by the convergence of telecommunications, computers, satellites, and fibre-optics technologies. It is fuelled by the rapid and sustained fall in the cost of processing, storing, and transmitting information. This sharp fall in costs—along with an increase in the technological and human ability to access, interpret, and use information—promises to make the knowledge base of mankind available anywhere, anytime, in any language.
>
> In an increasingly knowledge-based economy, information is becoming at least as important as land and physical capital. In the future, the distinction between developed and non-developed countries will be joined by distinctions between fast countries and slow countries, networked nations and isolated ones. The information revolution offers Africa a dramatic opportunity to leapfrog into the future, breaking out of decades of stagnation and decline.
>
> Africa needs to seize this opportunity, quickly. If African countries cannot take advantage of the information revolution and surf this great wave of technological change, they may be crushed by it. In that case, they are likely to be even more marginalised and economically stagnant in the future than they are today. Catching this wave will require visionary leadership in Africa. ...

The same World Bank document quotes its Vice President, Finance and Private Sector Development, Jean Francois Rischard, saying:

> Not only do we have to spread information technology around, but also we have to completely change the whole approach to education

> and more generally knowledge. We have to turn countries into what I call learning nations.

These citations from this World Bank document highlight all the points about the importance of ICT for education, training, and the concomitant social and economic uplifting and empowering in Africa. This will have to be measured against the harsh realities found on the African continent—realities that are often due to governments not understanding the fundamental changes that ought to take place to put a country on the road to the information society. Such governments may actually hamper the progress of their country by inadvertedly erecting artificial barriers, especially in the telecommunications field. This is underlined by the words of the South African Deputy President, Thabo Mbeki (also quoted in the World Bank Report):

> It's clear that bringing developing countries onto the information highway constitutes a colossal challenge if we are to promote economic growth … the reality is that there are more telephone lines in Manhattan, New York, than in Sub-Saharan Africa.

Education administration and the Internet

As far as education administration is concerned, it is of vital importance to interconnect the administrative arm of any education department and all its ramifications over the length and breadth of any country by means of an Intranet combined with an appropriate Internet component. This will ensure consistency of administration, especially if the system is built around an information database that operates on Internet lines. Such a database is open to all staff, but the level of openness is determined in each case by the principles of "need-to-know" and "nice-to-know."

As a next phase, the administration at each school can be connected to an Intranet with its own Internet-like database, which will increase the efficiency of each school and the keeping of records, as well as the sharing of equipment, such as printers and fax machines.

Finally, the administrations of all schools can be interconnected through the Internet. Enhancing the functionality of any school system. Applications are, for instance, the distribution of notices, policies, educational material (even books can be distributed virtually, eliminating the costly transport, storage and checking facilities; copyright can always be negotiated), examination papers (that can be printed on site), marks of pupils at examinations, and fingerprint identification of examination candidates. The usage is limited only by the collective lack of imagination in the educational sector.

Education and the Internet

Internet access can be used for many purposes within an educational system, such as the following:

- Connecting (teachers and pupils) to a resource centre database containing educational materials. Resource centres will become one of the central features of an education system in any modern country; they set the educational system free from any geographical restrictions, and one centre, equipped with fast servers and databases, can serve a region, sub-region, or even the world.
- Connecting school classes to one another in widely different social and economic regions of the world. This will become one of the major upliftment forces in the world, since it will generate emulative forces—both ways.
- Connecting classes, teachers, or pupils to world-class experts anywhere in the world to give and receive information and instruction.
- Enabling classes, teachers, or pupils to access information resources situated anywhere. This challenges the position of the teacher as

the sole dispenser of knowledge and enables the classes to really make use of the opportunities offered by outcomes-based education.

- Enabling education departments to develop online programmes that can be taken by any pupil from anywhere (even from home, provided Internet connectivity exists). This will relieve the need of building and outfitting an infinite number of new classrooms and training a diverging number of teachers. While it is costly to develop and produce such programmes, it is much cheaper in the long run than the classroom model.
- Introducing the concept of freedom-of-choice into any education system, since equivalent courses can be mixed and matched according to the beliefs and cultures of mixed local populations.

The current situation

An International Map of Internet Connectivity (version 13) of February 15, 1995, can be found on the site of the Internet Society, at *ftp://ftp.isoc.org/isoc/charts/connectivity/connectivity-map-v13.gif*. Its story is clear, namely that at that stage Africa was virtually unconnected to the Internet—with a few exceptions, such as South Africa. However, there was much improvement since as described below.

Detailed lists of all African countries connected in 1995 to the Internet are found at the same site, as well as the status of their connectivity, and their ISO country codes. The World Bank operates a Forum to Promote Internet Connectivity in Africa via its Web site: *www.worldbank.org/aftdr/connect/connpoor.htm* and at the site *www.worldbank.org/aftdr/connect/conmain.htm*.

In his reports, Mike Jensen (an ICT consultant with extensive knowledge of telecommunications and networking in Africa) states that 49 of the 54 countries and territories in Africa have Internet access in their capital cities. (This section of this report draws heavily on the work of Jensen (with permission). His work can be found at *www3.sn.apc.org/africa* (Africa Internet connectivity), *www3.sn.apc.org/africa/partial.html* (continent-wide connectivity indicators), and *www3.sn.apc.org/africa/projects.htm* (international ICT projects in Africa).)

The most recent developments in this field are summarised by Jensen:

- Four countries have plans for full Internet access in the capital cities: Congo-Brazzaville, Libya, Cap Verde, and Somalia.
- One country remains without plans for full Internet access: Eritrea.
- Seven countries have only one full public access ISP after 12 months: Algeria, Burkina Faso, Central African Republic (CAR), Ethiopia, Mauritius, Niger, and Seychelles.
- Twelve countries have local ISPs or POPs in some secondary towns: Angola, Benin, Botswana, Egypt, Ghana, Kenya, Morocco, Namibia, Nigeria, Tunisia, South Africa, and Tanzania.
- Eleven countries have local dial-up Internet access nationwide: Burkina Faso, Ethiopia, Gabon, Malawi, Mali, Mauritius, Morocco, Senegal, Tchad, Tunisia, and Zimbabwe.

While noting that most African capital cities have Internet access with more than one ISP, the number of users is still very small. The top 10 countries with the most users are South Africa, Egypt, Kenya, Zimbabwe, Morocco, Tunisia, Ghana, Mozambique, Uganda, Zambia, and Ethiopia. However, there are only about five countries with over 5,000 users, with South Africa being approximately 30 times larger than any other country in Africa. There are a number of multinational ISPs operating in Africa (e.g., AfricaOnline, UUNET, and Swift Global)

Current usage in Africa is estimated to be 800,000 to one million, of which most (approximately 700,000) are in South Africa. This implies a ratio of one Internet user for every 5,000 people.

As well, while most African countries have Internet access, there is still the problem of providing access to the population that lives in rural Africa. Cost is key to this issue. Some countries like Burkina Faso, Gabon, Malawi, Mauritius, Mauritania, Morocco, Niger, Senegal, Chad, Tunisia, and Zimbabwe all enable Internet access to be cheaper by charging local call tariffs. This allows ISP to roll out a network with national coverage, as it can be certain of greater users, thus making the service cost effective.

Factors promoting Internet connectivity in support of education in Africa

A number of factors affect Internet connectivity in Africa. These include connectivity costs, access to international connections, availability of bandwidth, and usage by different sectors of society.

The need for increased international bandwidth for carrying interactive activities over the Internet is still a crucial requirement for its effective use. Most international connections are carried via satellite, and will increasingly be done via the marine optical fibre link from South Africa. These Internet circuits are mostly connected to the United States, the United Kingdom, or France, implying that the ISP would need to pay the entire costs of connections to either Europe or the U.S. This has serious implications, the most serious of which is the cost. Due to the high international connectivity costs, local access is a major barrier. In some cases, local calls cost over US$10 an hour.

However, despite the hurdles, there is increasing usage of the Internet and other telecommunications for education purposes. The development of telecentres (a public site that offers access to telephony, and increasingly to fax, e-mail, and full Internet services) is growing. In some African countries, the telecentre concept is being expanded to offer access to learning.

Most African universities have e-mail connectivity and about 13 countries have universities with full Internet connectivity. (Often such facilities are restricted to staff and post graduate students.)

While the quality of telecommunication infrastructure is poor and lacks national penetration, many African countries have made telecommunications a priority and are in the process of installing fibre-optic backbones and the newest cellular and mobile technologies. Among the most sophisticated national networks in the world are those found in Botswana and Rwanda, where 100% of the main lines are digital.

The liberalisation of the ICT sector is occurring in some countries, which will enable private sector companies to build the necessary infrastructure. However, many countries still have some way to go, as the telecommunication sector is seen as an important revenue base. A key development is the African satellite consortium that is expected to launch its own satellite. Satellite-based communications systems are being planned and should radically improve access, especially in rural areas.

Ongoing problems with Internet connectivity

A number of very important conclusions about problem areas that apply specifically to the African situation emerge when the previous sections are analysed. These must be fully considered by anyone interested in improving the state of education on the continent. If the following problems are not solved, Africa will remain in the ICT rut that it is in today. These problems are:

- Although Internet connectivity on the African continent has increased beyond anyone's wildest dreams in the last two years,

the penetration is still too shallow. Although Africa as a whole is beginning to grasp the importance of the Internet, especially for education and economic empowerment, not enough priority is given to its development.

- Internet connectivity is still concentrated in the capital cities (or major cities) of African countries. Central planning must be started to extend the services into the rural areas. This situation may be due to governments not fully understanding the benefits of and infrastructural requirements for the information age.
- Internet connectivity is hampered by the presence of antiquated telecommunication grids in most countries. Countries should plan centrally to increase their digital and optical cable networks. A factor that could come to the rescue of the situation is the advent of satellite telecommunication and Internet services.
- Internet connectivity costs are far too high for the average person in Africa. Innovative actions are required, and Jensen refers to a Zimbabwean example where any call to an ISP (that mostly operates from one of the larger cities or towns) is charged by the Zimbabwean Telecommunications authority as though it were a local call, plus a small surcharge. This prevents the installation of expensive POPs by ISPs in areas that are almost certainly "financially non-viable," and it extends the benefits of the Internet to many more of its citizens. In fact, it is almost a model solution—one that can be emulated by other countries. There are actually 10 more states on the continent that have the same system as that of Zimbabwe.
- In many countries there is no effective telecommunication competition, which may contribute to the "backwardness" of telecommunication networks on the continent. For instance, telecommunication revenue often flows into state coffers and is used for other projects and experiments, allowing the telecommunication infrastructure to age and deteriorate. This monopoly may hinder the deployment of satellite-based telecommunication. It will also influence Internet connectivity negatively.

Satellite Footprints over Africa for TV

The presence of adequate radio and TV satellite transmission capacity over Africa is of the utmost importance for any technology-enhanced teaching and learning programme that intends to reach all levels of the population. The nature of the African terrain does not allow land-based TV and radio systems to reach everywhere. The same is true for normal terrestrial telecommunications. However, satellite-based telephony may make a major contribution in the future, especially with data transmission for Internet-related education and training.

Intelsat operates several satellites that have footprints covering parts of Africa and that are important for teaching and learning. A description of the Intelsat satellites, as well as an indication of their services and their footprints can be found at the Web site *www.itelsat.com*. Intelsat satellites connect different parts of the world through voice/telephone services, data transmission, facsimile delivery, Internet communication, news, sports, and entertainment television.

The Intelsat 704 (IS-704 at 66°E) is representative of satellite operation over Africa, and it is used by several South African virtual teaching institutions including the University of Stellenbosch's distance education programme and the African Virtual University. The footprint covers most of the Southern African Region, as well as most of the African region north of the equator.

Satellite Footprint over Africa for Radio

Most of the satellite radio coverage can be found in the kind of satellites described above, in the section on TV. However, there is a special radio project, the WorldSpace radio satellite system, which may be advantageous for education and training, since it will reach billions of people in all regions of the earth. Their Web site is at *www.worldspace.com* and contains much relevant information.

The WorldSpace radio satellite system also forms part of a research project in Africa supported by the WorldSpace Foundation of Washington and the Commonwealth of Learning. The Web site of the WorldSpace Foundation is *www.worldspace.org/aboutws.html*, while that of their three major African projects is part of their International Program Site at *www.worldspace.org/programs.html*

WorldSpace is poised to bring information and entertainment to about four billion people around the earth by beaming down "an extraordinarily variety of digital sound broadcasting" by means of three specially designed tailor-made and dedicated geosynchronous satellites circling the earth.

It is estimated that these satellite signals will reach more than 80% of the population of the earth, offering an unprecedented opportunity to provide information and to teach. To put it bluntly, people in all corners of the world will now have the opportunity to be exposed to information. They will be able to learn things they would never have the opportunity to learn in any other way.

These digital radio satellites are called AfriStar (at 21°E), AmeriStar (at (95°W) and AsiaStar (at 105°E), respectively. The WorldSpace Satellite System has all the necessary ground, satellite, and control technology in place to make this an economically and technically successful venture.

The technology of broadcasting with the satellite system is very simple. A ground radio station relays its signal through a small satellite dish to the geosynchronous WorldSpace satellite that then, in turn, broadcasts it digitally. This satellite signal can then be picked up all around the world. The company offers to both radio stations and to users a "one-stop deal." In other words, everything is provided.

The company will also provide small radio receivers for ground use by listeners. The drawback seems to be the cost of these receivers. According to an article in the *South African Sunday Times Business Times* (October 25 1998, p.13), they cost around R1,500 (about US$260). This might place it out of the buying range of many (if not most) people in rural Africa, and that is precisely the group WorldSpace is trying to reach.

There are at present 37 committed broadcasters, including 11 from Africa, taking up 58% of the satellite capacity. The *Sunday Times* article states that it will cost a radio station up to R30 million (about US$5 million) to sign up with the system.

There are several very important points to consider:

- WorldSpace mentions entertainment and information (or teaching) in the same breath. A system such as this is far too expensive to provide only teaching and training. The entertainment channels will most probably carry most of the vast financial burden of the research, designing, testing, launching, and initiation costs of the project, as well as that of its daily operation. This allows education programmes to piggyback on the entertainment channels.
- Sound quality is of the utmost importance. Bad reception will ruin any music programmes, as well as any educational programmes. The design of the satellite signals allows the quality of the digital sound to be the same as digital stereo CD.

- Any local radio station can become an international station by merely relaying its signal via a simple antenna dish to any one of the three geosynchronous satellites of WorldSpace. In addition, the signal quality far surpasses that of any land-based antennae system. It also reaches most, if not all, of the people in the footprint areas of the satellites (no more blackout areas).
- The WorldSpace system gives any local radio station the opportunity to continue to transmit in any of the local languages and or dialects, while becoming "international," as well as reaching more of its own local population by a better signal distribution. The system thus does not "kill" local languages in favour of the more international languages like English, Spanish, and Portuguese. It is actually the other way around, as it encourages the transmission in these local languages. In this fashion, it provides an excellent medium for education and training using the local vernaculars.
- The transmission system of WorldSpace makes use of a terrestrial antenna beaming the radio signal to the satellite, which then re-broadcasts it. This could lead to legal telecommunication problems in the countries that have restricting regulations. This may possibly, for instance, hamper its implementation in South Africa.
- The cost of ground receivers will have to be reduced to pull in the masses, especially if the system wants to attract the attention of education authorities in the developing countries where the lack of adequate funds for education and training is a perennial problem.

The project itself, its impact on listeners, and its use in education cannot yet be evaluated since it is in its initial stages. The first satellite was launched only at the end of October 1998. However, the project is of sufficient importance to follow closely and to start educational pilot projects under carefully controlled conditions. The project will have to grapple with financing the massive amount of training of the educational staff who are going to provide the classes over the air. The same is true for the educational design, production, and distribution of the (printed) material that accompanies such a series of classes.

South Africa: A Representative Example

South Africa has the benefit of an extensive communication infrastructure, consisting of all the elements that a modern state might need to propel itself into the information age—for a part of its population. This infrastructure, however is of such a nature and size that it would be relatively easy (given the funds) to upgrade it to serve its whole population. South Africa is, therefore, taken as a representative example of such a country on the African continent. Some of its efforts to acquire the benefits of virtual teaching are described below.

Current developments

The Jensen site at *www3.sn.apc.org/africa/southafr.htm* outlines current developments in the ICT sector in South Africa. The following is a summary of developments relevant to virtual education.

- In March 1998, the South African cabinet approved a proposal to develop a national information and communication technology strategy. Key to this strategy is the consolidation of all existing government networks into an Intranet, based on a high-speed fibre-optic backbone. The Department of Communications has been given the responsibility for driving such infrastructure developments.

- One of the key interventions being made is the establishment of the Universal Service Agency (USA). This agency was established by an Act of the South African Parliament and has the responsibility for ensuring universal access to all telecommunication services. There are various initiatives focusing on the use of such telecentres to support learning and teaching.
- The Foundation for Research and Development (FRD) is responsible for supporting academic research projects and operating the Universities Network (UniNet) *www.frd.ac.za*. UniNet provides an Internet backbone that connects an estimated 500,000 students and staff at 21 universities and 15 technikons, as well as to universities in Lesotho, Mozambique, Swaziland, and Tanzania. (Note that UniNet is presently undergoing a restructuring process.)
- Recently, the Department of Education played a leading role in the establishment of SchoolNet SA, the national body, which will co-ordinate the linking of South African schools to the Internet. The SchoolNet SA structure consists of an executive council with participants from the Department of Education; Department of Arts, Culture, Science and Technology; Department of Communication; the Department of Trade and Industry; and regional school networking organisations. Provincial SchoolNets will be encouraged and supported while three advisory groups focusing on issues of connectivity and technology, human resource development and training, and content generation and curriculum will provide direction for SchoolNet policy (*www.school.za*).
- University of South Africa (UNISA) provides distance education to 130,000 registered students, many of whom are outside of South Africa, and it has an extensive ICT programme (*www.unisa.ac.za*). Through agreements with host institutions, UNISA maintains examination centres in Angola, Botswana, Cote d'Ivoire, DRC, Egypt, Gabon, Kenya, Lesotho, Malawi, Morocco, Mozambique, Namibia, Swaziland, Senegal, Tanzania, Tunisia, and Zambia.

  ICTs are also an important component of UNISA's recent partnership with the two other major South African distance and continuing education institutions, Vista University (*www.vista.ac.za*) and Technikon SA (*www.trsa.ac.za*). Called the Confederation of Open Learning Institutions in South Africa (COLISA), it will jointly implement a number of ICT applications, many of which have already been developed at UNISA, including the following:

  1. The development of Internet-based courseware (a course in Arabic has already been developed and one in Chinese is planned).
  2. A Web-based student-teacher interaction system providing for the submission and tracking of assignments and marks by the students and teachers, communicating with their lecturers and fellow students via electronic mail, and the cataloguing of the library (Students Online: *https://sol.unisa.ac.za*).
  3. A series of local Internet access points for students, including a print-on-demand facility for course notes. The first stage of the project has been to set up a pilot programme using 1,500 Sun Java Stations (with SUN providing soft finance for the equipment).
- With a combined studentship of over 250,000, and a rapidly maturing virtual learning environment, COLISA expects to achieve

the economies of scale and to attract the expertise necessary to be a world force in distance education. This is partly the reason for the development of the Arabic and Chinese courseware.

- UNISA has developed the first postgraduate course in Southern Africa on telecommunications policy. Officially supported by the African National Congress (ANC), the course has been developed with assistance from the Flemish (Belgian) Ministry of Education.
- Gold Fields Library and Information Services at Technikon SA has started a South African Copyright Forum (SACFO) (*http://pgw.org/sacfo*) and the Council for Scientific and Industrial Research (CSIR) has a wide range of ICT related activities (*www.csir.co.za*).
- CSIR's MikomTek department is the unit most involved in ICTs and is in the process of developing a national and sub-regional strategy for supporting the development of ICT applications. MikomTek has developed a public access information kiosk and a wireless metropolitan data networking system based on the spread spectrum WaveLan system (*www.cids.org.za*). MikomTek also hosts the Satellite Applications Centre (*www.sac.co.za*) that supports remote sensing and GIS applications development.
- SANGONet (SN) was the first non-academic full Internet provider in South Africa and is a member of the Association for Progressive Communications (APC), focusing on supporting the NGO sector both inside the country and in the region (*www.sn.apc.org*). SN currently provides e-mail gateway services for small store-and-forward service providers in Malawi and Zimbabwe and regularly runs training courses and supplies technicians, trainers, and workshop organisers for projects in the region. SangoNet is collaborating with USAID in the establishment of a Southern African technical help desk for NGOs, and researchers in universities and government institutions in the sub-region. It has also recently launched the women's networking project with support from the Commission on Gender Equality (*http://womensnet.org.za*).
- The Internet Society South Africa Chapter was recently formed and is developing a regular events programme (*www.isoc.org.za*).
- University of the Witwatersrand runs the Programme for ICTs in Development, which has recently begun a project called Building a Telecentre Network for Africa in collaboration with CISDA (*www.wits.ac.za*).
- University of Port Elizabeth Institute for Development Planning and Research is assisting with community information access (*www.upe.ac.za*).
- Kara Interactive Solutions has developed a public access information kiosk and associated multimedia applications. It is working with the Department of Sports to roll out telecentres in youth centres.
- The National Inquiry Services Centre (NISC) maintains bibliographic data and information on museum collections online and on CD-ROM (*www.nisc.com*).

Other institutions with an involvement in ICTs in the country include the following:

- University of Natal (*www.und.ac.za*)
- Business Management Training College of South Africa (*www.global.co.za/business/bmtc*)
- Cape Technikon (*http://www.ctech.ac.za*)
- Technikon Natal (*www.ntech.ac.za*)
- University of Stellenbosch (*www.sun.ac.za*)
- Technikon Orange Free State (*www.tofs.ac.za*)

- University of Pretoria (*www.up.ac.za*)
- University of the North (*www.unorth.ac.za*)
- University of the Orange Free State (*www.uovs.ac.za*)
- Potchefstroom University (*www.puk.ac.za*)
- University of Cape Town (*www.uct.ac.za*)
- Technikon Witwatersrand (*www.twr.ac.za*)
- Port Elizabeth Technikon (*www.petech.ac.za*)
- Eastern Cape Technikon (*www.tktech.ac.za*)
- Technikon Pretoria (*www.techpta.ac.za*)

Government policy and information technology

South Africa has the benefit of a government that realises the advantages of the information and telecommunication age. The government actively plans, encourages, and supports the development of the necessary infrastructure, including upgrading city and rural networks to fibre optical systems and all exchanges to digital exchanges, and installing microwave communication and satellite technology. Millions of new telephones are installed, or are in the process of being installed into homes, especially those of the previously disadvantaged part of the society.

South Africa is well covered with POPs for Internet connectivity, as can be seen from the Jensen site at *www3.sn.apc.org/africa/southafr.htm*. There are 22 POPs for SAIX, while the largest commercial ISP has 23 POPs. However, the issue of local connectivity is still problematic. There are eight "top level" ISPs with their own international leased line links. Dial-in customers, as well as subsidiary ISPs leasing line capacity from them, use these links. Currently, there are more than a million Internet users in the country, including far more that 200,000 dial-up subscribers.

The major telecommunication supplier in the country is Telkom, which is 70% owned by the state, 20% by SBC, and 10% by Malaysia Telecom. Telkom will retain its monopoly until 2002 (see *www.telkom.co.za*).

There are two big cellphone companies: Vodacom (50% owned by Telkom) and MTN that cover the main areas of the country with a microwave grid, reaching into areas that were previously underserved by digital communication technology. These developments make computing (e.g., data exchange such as e-mail) possible while being "on the road." They also open up new educational markets. (See *www.vodacom.co.za* and *www.mtn.co.za*). One other company will be awarded a licence during 1999.

Furthermore, the Electricity Company, ESKOM, plans to electrify just about every home in South Africa. In addition, it is rolling out solar electrification for those communities for which grid supplied electricity will be too expensive. This applies especially to those schools that will never be connected to the grid.

The SABC is the public broadcaster, and the country is covered by a grid of antennae beaming out the signals of three very good TV stations, as well as some FM, AM, and shortwave radio stations. There is also a satellite broadcasting analogue TV signals, although this will be phased out in the future.

In addition, there are two private broadcasters: MNET and ETV. MNET uses terrestrial and digital satellite broadcasts. Since October 1998, it has also broadcast the TV signals of the three SABC stations. This operator's satellite footprints cover large areas of Africa. ETV is a commercial free-to-air broadcaster that has been awarded the licence to broadcast in South Africa.

There are many small local radio stations dotted all over the country, rendering an excellent local service in many of the indigenous languages of South Africa.

South Africa's educational system is well organised, but suffers from overcrowding of

schools and the lack of funds to fully implement a new curriculum. The intention is to transform education into a lifelong learning education and training system for all citizens.

In short, although the infrastructure does not benefit all its citizens at present, South Africa has the necessary nucleus to build on. In addition, it has or is developing the plans to build the needed infrastructure fairly soon for the benefit of all its citizens.

Education policy and information technology

The Department of Education of South Africa realised that it could make a major difference to education in the country by enhancing the present education system by means of telematics. It therefore commissioned the so-called TELI Report (*Technology-Enhanced Learning in South Africa: A Discussion Document*, Report for the Minister of Education, 1996, Pretoria). This was followed by various policy documents. The department has a very active National Centre for Educational Technology and Distance Education in Pretoria (*www.ncetde.co.za*).

Some of the provinces also have active plans for telematic learning projects, and all are interested in Internet-related education. But there is as yet no coercive groundswell to generate results. However, there are signs that many of the individual groups asking for such education are coming together to form one large pressure group that may be constituted in such a way that individual needs are not subjected to those of others.

Universities and technikons

There is a general trend for all tertiary institutions to move towards distance education in support of the policy of the government as expressed in various white papers, policy documents, and acts. Many, if not most, traditional contact tertiary institutions are moving towards the ideal of the mixed mode, where campus students are treated as though they were distant for part of their courses by the addition of telematics and World Wide Web features.

The inverse is happening at the traditional distance teaching tertiary institutions. They are adding contact parts to their operations, such as study centres in different parts of the country, populated with appropriate tutors and officials specially trained in counselling. They are also moving towards telematics and Web technology.

A convergence in the roles of the traditional contact and distance teaching universities is thus developing. This trend becomes very clear in the examples below. The impact on the traditional distance teaching universities caught them unawares and may lead to enormous stresses and strains in their infrastructures. In fact, trying to determine whether or not they should move towards the modernisation of their methods of communication with their students wastes much time and leads to unnecessary polarisation within the institution. Some of them still do not have a full transformation policy, and the movement towards modern methodologies is often spearheaded by a small group of individuals with a "vision."

Each of the examples below exemplifies certain important aspects of the transformation. As a group, they display many of the problems and successes of the transformation process. Valuable conclusions can be drawn from these examples—conclusions that will be valid for the whole continent of Africa.

The University of South Africa (UNISA)

The University of South Africa (UNISA), with its administrative seat in Pretoria, is the oldest distance teaching university in the world. It was established in 1875 as one of the examination

arms of the University of London. In 1946, it was transformed into a teaching distance university and grew to one of the mega-universities of the world, using advanced printing technology.

UNISA has about 125,000 students, mainly from within the borders of South Africa. They range from the poor, rural, and non-electrified areas, to the cities with their first-world infrastructures and telecommunications. There is a sizable component of students from international locations; this number is growing and they clamour for telematic enhancements.

UNISA has a main campus in Pretoria, as well as subsidiary campuses in Cape Town, Durban, Pietersburg, and Mpumalanga, which are connected to the main campus by fast data lines. The university has about 4,000 administrative, academic, and research staff.

UNISA is following the recent trend of providing study centres all over the country, each "stocked" with appropriate tutors and other support staff. Telematic enhancement will play an increasingly important role, since it is very expensive to provide buildings and tutors.

UNISA has an extensive modern computing system, networks, and other electronic equipment to handle all parts of its operations that are amenable to digitisation. The university developed the massive student system of programmes over a period of more than 30 years, allowing for economies of scale. All staff members who need a PC have one; all are connected to the local LANs and WANs and to the Internet. The university currently has about 4,000 PCs connected to the network, as well as hundreds of printers and scanners. The printing works of UNISA is the biggest on the African continent, with the exception of a few newspaper printing presses. It handles millions of postal items yearly through an automated postal system.

The budget of the university is just less than one billion Rand (about US$180,000,000) per year. However, the state subsidy per full-time equivalent student is much less than that of other universities, and its student fees are also appreciable lower.

The diverse nature of the student body presents a dilemma for the university: it would like to teach through the modern technologies, but many of its students do not even share in the advantages of electricity and telecommunication infrastructures. It cannot proceed out of a feeling of fairness to all its students, and it cannot stagnate or it will experience erosion of its student body to other more nimble institutions with the required vision to use modern telecommunication advantages.

The university itself has the most modern computing, telecommunication, and other infrastructure at its campus in Pretoria needed to make this transition to technology-enhanced distance education. However, it is almost hobbled by indecision about its role in the world of modern telecommunication and computing, since it feels that some of its students are not ready for the transition. However, it is paving the way with its virtual arm, which still does not form a part of its main operations but does make it ready for its task. At the same time, this virtual arm benefits those students with the required technologies, such as Internet connectivity.

The university has opted to move towards the building of a virtual university by a series of steps that are designed to test the use of technology and to encourage the staff to participate. There are five areas in which the university is making very rapid progress:

- A Web-based virtual university, called Students on Line (SOL)
- Audio-visual aids
- Tele-and video-conferencing
- Web-based information services in the library
- Other relevant areas.

Students on Line (SOL)

The first area, Students on Line (SOL), allows the university the advantages of modern communication and education technologies to improve its own administrative, educational, and training services for the convenience and advantage of its staff and distant students. SOL allows students to access parts of the massive university databases on their own at any time, from anywhere without requiring the services of a staff member. They can register for courses, pay their fees, download course materials, post assignments, and browse the library catalogue system—all through SOL. This service saves staff costs and allows staff to be used more cost effectively in areas where they are more needed.

More information about SOL can be found on the Web sites *www.unisa.ac.za* and *https://sol.unisa.ac.za*. On the latter site there is a virtual tour of the SOL site and its activities available.

The SOL system of the University of South Africa is fast becoming a model virtual university and is worth taking note of, since the university is ideally placed to be reached by anybody on the African continent having an Internet connection. The university already has several thousand students on the African continent and is setting its sights on expanding to institutions north of South Africa. There is, in fact, already collaboration with institutions in Zimbabwe, Zambia, Israel, and Korea.

The main problem that students experience is lack of access to the Internet. However, the presence of very many Internet cafés in the country is alleviating that. The Department of Communication is experimenting with telecentres that will very soon be placed in all post offices and other centres in South Africa, which will alleviate the problem even further. More and more schools are also being connected to the Internet (there are already more than 500 of them!), and they are realising that this could generate income for the school if their connectivity is used commercially after hours. At present there are over a million users of the Internet and the Web in South Africa, and their numbers are growing quickly.

In addition, the university is involved in an imaginative scheme, collaborating with two other distance teaching tertiary institutions and a commercial firm, that could provide free Internet access to its students. This shows that Internet connectivity may no longer be problematic in the near future. The university can then channel more of its resources into the development of fully interactive courses for the Web. It may be advantageous for the university to lower the fees for Internet courses slightly to offset the cost of connecting for the students. This should be a realistic option for the university because it will save considerably on the cost of printing, handling, and postage.

Both staff and students who have used the SOL system seem to be impressed. Members of staff are also increasingly using the "twin" of SOL, Lecturers on Line (LOL), that supports them and their activities. Very soon LOL will be a powerful force among the academic and administrative staff of UNISA.

Audio-visual aids

UNISA makes an effort to help blind students by providing audio versions of study material, including all study guides. The university annually produces over 500,000 audio cassettes for various courses to enhance the printed study material. In addition, a small but growing number of courses are augmented by video cassettes. These are produced in fully operational modern studios.

Tele- and video-conferencing

UNISA is one of the world leaders in fully interactive video-conferencing and operates four sites (one at each of its campuses). This feature was added to its distance teaching operation and is proving to be very popular among both staff

and students. In fact, the use of the equipment is fully booked and the university is looking for funds to increase the number of sites, as well as the number of primary studios.

As the advantages of the medium permeates through the university, more and more staff and departments are realising that they can contribute much to the learning experience of students by switching to the new medium. And as the quality and size of the networks in the country increase, the university will switch more and more to Internet video-conferencing. Preliminary steps have already been taken in this direction.

Problems experienced

The main problem in implementing distance education is, as has been discussed, the lack of support from the top management. Fortunately, in the case of UNISA, there was a group of very enthusiastic and knowledgeable academics and administrative staff that created SOL, LOL, and all the other Web requirements. These services were introduced into the system as an experiment, using old, written-off servers. The necessary modern hardware and software (around R500,000 or US$90,000) were bought from a grant of the University Council. This experiment was so successful that it now forms part of the educational model of UNISA. It is still not a required part, but that may soon be an essential part of it.

The second problem is in the area of socio-economic development. South Africa has just come through a period of repression and separation into the "haves" and the "have nots." Technology, however, has the ability to introduce a new kind of diverging separation into society: those who can afford it and become ICT literate, and those who cannot.

Academic institutions are caught in a dilemma. If they introduce courses that are reliant on ICT for the mode of delivery, many students with no access to such technology are at a distinct disadvantage.

Another problem experienced was that the academic staff was fully committed to the printed mode of distance education. There was also no time and/or funds available for the intensive and expensive retraining that goes hand in hand with a transformation to a model that rests upon modern communication and computer technology. The whole educational model will have to change and staff will have to be "rebooted" in a new methodology. All this is not so easy, and it usually is best to proceed with a small number of ICT champions if the university management does not enforce the change by committing adequate funds, time, and, above all, a driving vision to the transformation.

The communication backbone of South Africa is able to support the present level of Internet technology and it is being upgraded at a breathless pace. Telephones are being installed in the homes of the previously disadvantaged at a rate that caught the distance teaching universities unprepared. UNISA now gets up to about 70,000 incoming calls daily, many from people who have never had a telephone before.

All this means that about 300 people are needed full time to answer the incoming calls. Once this was realised, it was easy for the university to make the step to using Internet technology to change the nature of the calls from verbal requests to Internet inquiries. This diverts as many as possible incoming inquiries to an Internet-based system, such as SOL having all the administrative capabilities. Creating a virtual university can, therefore, in principle solve the problem of telephone access.

Technikon SA

The Technikon SA (TSA) situated in the East Rand part of Johannesburg, is a technical distance education university that has recently made the formal decision to "go virtual." It has a very well-defined policy to execute this fundamental

transformation from paper-based distance education in the technical field to virtual, including staff training.

The management of the university made three very profound strategic decisions in 1996–1997 that increased the use of information technology at TSA:

- To pursue a course of flexible and open learning.
- To use technology-enhanced teaching and learning as a strategic thrust to ensure its global competitiveness in the 21st century.
- To emphasise inter- and intra-institutional co-operation.

The Integrated Technology Centre

An Integrated Technology Strategy (INTES) was set up to ensure optimal and cost-effective use of technology. It was soon clear that INTES alone was not enough and that there should be a physical structure (separate from that of the computer centre) to take care of the administration of the operation. Consequently, the Integrated Technology Centre (ITC) was established in October 1998 after 14 months of careful planning. The vision of the ITC, a multifunctional and multidisciplinary unit, is to encourage educational innovation through the use of technology. Its "customers" are the students and the staff (academic as well as administrative), as well as outside clients.

The ITC is structured into three areas: multimedia and online services, audio- and videoconferencing services, and technology support and promotion. Under this structure the qualified staff is responsible for everything from database interface programming and Web design to audio and video streaming through the Internet.

The TSA has the necessary infrastructure to implement the ITC programme. Its success is evident in its ability to create a fully functional virtual campus on the Internet, fully integrated with its administrative systems and academic functions in a very short space of time. The virtual campus is called TSA Online and has some areas in the public domain.

The Web site is at *www.trsa.ac.za*. The site has much study material for students, such as tutorial letters, study guides, and more. Very soon the first fully interactive study material will appear on the Web, which will eliminate weeks in postal delays.

Reactions of staff and students

The reactions of students who have Web access are very positive. However, not all staff have "bought in" and the TSA is addressing the problem aggressively by means of awareness sessions.

Despite the reservation of some staff members, the example of TSA shows that it is possible to convert an institution from one technology to a dual-mode technology with careful planning, adequate funding, and, above all, by a management that actively pushes for it because it believes in the change of direction. In this regard, TSA is a model worth emulating.

University of Pretoria

The University of Pretoria is a residential city university that draws its students from all over the country. It teaches in the traditional face-to-face mode in two languages. It has a huge campus in the centre of Pretoria with many beautiful buildings.

The University of Pretoria presents an example of a transformation towards a virtual university and distance education driven by the management of the institution. The project, which started in 1998, is a model of a transformation that must unfold according to a carefully researched plan. It also illustrates the inordinate amount of effort that goes into the training of the academic, administrative, and management staff. And finally, it illustrates a plan to manage a mindshift on the campus towards a virtual university.

The university has consciously taken a strategic decision to aggressively move towards distance education through modern telecommunication and computing technology. This decision will also change the face-to-face model, since distance education technology will be used to enhance the performance of the university in the contact mode. In fact, it seems that the University of Pretoria is moving inexorably towards the dual-mode model.

The university has brought in much technology to enhance its mode of instruction. There are well-equipped computer laboratories, connectivity to the Internet through UNINET, and a good tele-conferencing studio connected to various schools in the vicinity for training programmes as well as to some outlying subsidiary campuses.

This transformation towards modern communication and computing technology is very much (but not wholly) driven by the management of the university. The management realises that the technology is the way of the future, and it has developed a coherent plan to allow it to use its own resources to drive the planned transformation. (This will generate new revenues to speed up the transformation.)

Management also realises that it could not work in isolation, and so it is integrating its administrative systems with two sister universities, namely the University of Stellenbosch in the Western Cape and Potchefstroom (see below) in the North-West Province. This collaboration allows the sharing of expensive resources, such as satellite.

The aim of the university is to create a virtual campus that is fully integrated into the present campus, making use of the contact model. This integrated learning system will incorporate an administrative interface, communication with tutors and lecturers, and courseware. It will also function as an Intranet within the university.

Another main goal is to manage the required mindshift of its administrative, management and academic staff to facilitate the successful implementation of a virtual campus. The aim is to shift from a classroom-controlled model to a self-paced learning system operating free of the constraints of time, space, and opportunity.

To realise this project, the university created a Department of Telematic Education. This department now spearheads the development of this very carefully managed project. The project plan unfolded in three main phases:

1. March to April 1998: Workshops and action research.
2. April to June 1998: Definition phase; determination of specifications and standards, ICT architecture, protocols, etc.; financial projections over the next two years; definition of an integrated courseware and administration system.
3. June to August 1998: Execution phase; development of the platform; comprehensive training programme for academic and administrative staff; development of a quality assurance tool.

The mainstream effort will go into the creation of a virtual university on the Internet. In this virtual environment students will be able to access and make use of all the facilities usually offered by a university, such as online inquiries, registration, library facilities, counselling, tuition, assignments, tests, etc. The university is creating this system from a zero base; it is intended to implement this phase very soon.

The other mainstream effort will go into video-conferencing and other interactive mechanisms. The university is already well known for its work with TELETUKS, the interactive video-conferencing system linking the main campus with the distant campuses, as well as to selected schools in the Pretoria area. The university makes use of terrestrial antennae, satellite transmission, and optical cable links of Multichoice's Satellite

Decoding Systems together with smart cards to transmit its signals to download sites.

The list of departments and faculties preparing to deliver coursework through the system before the end of the year 2000 is formidable and exemplifies the careful planning, as well as the successful management, of the change on the campus. Just some examples are the School for Information Technology, Faculty of Dentistry, Faculty of Engineering, School of Management, Faculty of Education, and Faculty of Science. The change in mindset allows the university to offer complete courses for entire fields of study and degrees instead of the spattering of non-integrated courses offered by other transforming institutions calling themselves virtual universities.

University of Potchefstroom for Christian Higher Education

The University of Potchefstroom for Christian Higher Education, one of the smaller universities in South Africa and situated about 100 kilometres to the southwest of Johannesburg, is pursuing an aggressive telematics policy. Its teaching language is mostly Afrikaans, but this does not stand in the way of offering curricula in English, as is the case for the programme discussed below.

In 1996, the university started a well-planned, affordable distance teaching programme, called Telematics Learning Systems (TLS) in a few very carefully chosen fields for which there were perceived demands. This demand is one of the parameters that guarantee large enough numbers of students per course to make the entire programme economically viable. The first graduates received their degrees at the end of 1998. The Web site of the TLS is *www.puk.ac.za/tls/tlsprog.html*.

The vision of the university is to offer "high-quality learning programmes of international standard for the development needs of the country and its people with a new learning model based on outcomes and student participation." The fields of study were chosen after careful consultation with a broad range of stakeholders in society, with special emphasis upon eventual economic empowerment of previously disadvantaged people. About 75% of the 2,500 diploma students and 1,000 degree students of the programme come from the previously disadvantaged part of society. That percentage is an early indication of huge success, and the project is very near to a breakeven point after just three years.

Students from all walks of life have enthusiastically supported the programme, which currently offers the following diplomas, degrees, and university certificates:

- Bachelor's of Business Administration
- Master's in Business Administration
- Nursing Diplomas
- Bachelor's in Nursing, as well as diplomas and certificates
- Diploma in Legal Interpreting

The following degrees and diplomas will be added to the programme within the next two years:

- University Diploma in English for Speakers of Other Languages
- Honours and Master's Degree in Public Management
- A Web-based Honours degree in Pharmacology
- The first year of the Bachelor's Degree in Engineering (together with the University of South Africa);
- A University Diploma in Recreation and Tourism

The Faculty of Engineering has also decided to join the project and will offer an exciting palette of courses.

The teaching programme of each course is built around the concepts of distance education, supported in various ways. First, the well-designed printed study package is sent by post to students. This package has been developed by about 60 academic staff members, together with about 600 people from all walks of life from all over the country.

Students can make use of more than 20 study centres in major areas of the country. At each study centre, a trained tutor or demonstrator is available for each subject, and regular group meetings are held at the study centres.

Telematic learning systems (TLS) in the form of interactive videos and satellite transmissions, as well as CD-ROMs, are available for certain courses. Soon, Web-based courses will be added.

Finally, the programme is supported by collaboration with other institutions of higher learning in South Africa and abroad, as well as with local institutions.

The development of the programme from a zero-base was very expensive, especially as there was virtually no culture of TLS or any of the required equipment on campus at the initiation of the project. The development was done at an average cost of about R200,000 (US$34,000) per semester course for the about 100 courses developed so far.

When analysing the programme, the following important points emerge:

- It is possible to start such a project from a zero base in a country such as South Africa provided it is well planned with realistic costing of the various phases (including planning for an early break-even point). Economically viable and socially needed courses must be identified and chosen in conjunction with relevant stakeholders in all walks of life. There must also be enough funding initially to provide the best training in TLS principles and practise for the staff involved, to buy the correct equipment and studios, to initiate the study centres and their equipment, and to find and train the tutors. Enough staff needs to be allocated to the TLS, and in such a fashion that each student feels individually treated.

  The technologies to be used must be carefully chosen to fall within the budget and must not intimidate prospective students, lecturers, and educational designers. As the user base increases and as the technological infrastructure in the country increases, other technologies may be added.

  Finally, collaboration with other institutions is of vital importance, since costs, facilities, and know-how are shared, which can advance the break-even point.
- The demands of the learners for distance education have changed: they like receiving tutorial support and group discussion classes, together with well-designed interactive study material.
- Study centres are well placed for the expected clientele and easily reachable by transport; all the necessary equipment must be available and must function optimally. There is nothing as frustrating as non-operating educational technology.
- Students like the modern approach of interactive technology much more than the usual distance education package; it gives them a feeling of being prepared for the technologies they will have to use in the future. (This applies especially to computer skills.)
- The use of multimedia CD-ROMs is one of the best ways of attracting students, even unwilling ones, to modern communication and educational technologies.
- The success of the initial courses ensures the start of a process of co-operative change. Interested staff members, and eventually, the whole institution, will accept the principles of TLS as being the best.

University of Stellenbosch

The University of Stellenbosch is one of the oldest universities in the country and traditionally teaches in Afrikaans. It has all the faculties usually associated with a university and teaches through contact mechanisms. During 1997, however, it decided to pursue a distance education model through modern telecommunication technology. What makes it different from other universities is that it has teamed up with a commercial company to provide some of the telematic services needed. This collaboration will, no doubt provide valuable experience in the future.

The university has accepted that it needs to develop a distance education model that ensures accessibility. With this in mind, the university has opted for three modes of delivery in the construction of the virtual university: the Internet, interactive television broadcasts, and paper-driven distance education.

As the system has just started up, an evaluation is not yet possible. However, there are already some important points to take note of:

- The university made the decision to incorporate distance education into its main mission; it will never be just an add-on.
- Distant and on-campus students will be treated in the same way through use of the technology.
- The emphasis is on affordable technologies for the student. This is achieved by closely collaborating with a commercial organisation already in possession of all the relevant technology, such as studios, downloading sites, as well as the required staff. There are no initial set-up costs.

The outcomes of this programme will be interesting to watch because the university has chosen a model of distance education that runs very close to their contact education model. Some aspects of it are actually classroom driven—similar to those of the African Virtual University. Another interesting aspect is that the university is concentrating on the urban areas of the country, thus directly competing with other institutions such as the traditional distance teaching universities like the University of South Africa and the Technikon South Africa.

Primary and Secondary Education Institutions and Teachers' Training Colleges

The educators of the country have a vision to leapfrog the paper age into the age of modern telecommunication and information. This means that all schools and all education departments will have to be supplied with computers, LANs, and the Internet, in addition to nationwide satellite communication and teaching facilities. This is not such a far-fetched dream: many schools already have computing facilities. Unfortunately this is not true for the rural schools and the more disadvantaged communities.

Internet connectivity: SchoolNet SA

Internet connectivity of schools is at present encouraged by the various Education Departments of the provinces, but not really funded in any serious way. It is mostly left to the management of schools and the support of the parents' community.

There are at present over 1,000 (out of about 28,000) schools connected to the Internet in South Africa. While the percentage is still low, the rate of increase is phenomenal, at about 100% per year. This huge growth indicates the need for formal planning by central and provincial education authorities. One of the areas being investigated is the creation of a huge central educational telecommunication backbone in the country.

About half of the schools connected to the Internet are linked to the massive University and Research Institutions Network, called UNINET. The rest make use of dial-up facilities through the nearest ISPs. Schools are required to defray all the costs incurred in the process, such as the Telkom line cost (dial-up, or leased, as the case may be), server, network, modem, and ISP costs. This is done through levies, parent-teacher organisations, local sponsorships, or donor funding. More about this can be found on the Web site *www.school.za/research*.

Also, there is now an organisation, called SchoolNet South Africa (similar to the SchoolNet Canada), initially funded by the IDRC and supported by the Department of Education. This organisation has a small staff dedicated to the development of Internet connectivity of schools. More particulars are found at *www.school.za*.

The following issues are facing schools:

- The present UNINET fees are difficult to manage, since they depend on the amount of data transported, which can be very high if too much international traffic is used. This is especially serious when the school comes from a traditionally disadvantaged sector.
- There are generally no ICT budgets in schools. Eighty-six percent of the schools connected to the Internet are formerly "white" schools. Their Internet costs are defrayed from school levies that parents must pay, from donor funds (often local donors, like businesses) and not from state subsidy. It currently costs from R30,000 to R60,000 (US$5,000 to $10,000) per year for Diginet access per school, to R1,500 (US$270) per year for telephone costs for ISP dial-up access. This cost will inhibit connectivity progress.
- Many schools lack the necessary electricity. The giant electric company, ESKOM, is currently implementing its electrification plan. Such a plan also calls for the use of solar energy to "wire up schools;" the idea is to do it as soon as possible. A further problem that faces schools is the payment of their electricity bills.
- There is a lack of management expertise of ICT facilities among school staff, including technical and software expertise, technical management of the network, as well as lack of appreciation from the top management at schools. If these issues are not addressed it will constrain school Internet connectivity for the foreseeable future.
- There are massive security problems for ICT equipment in schools. This is very serious in a country that is plagued by high criminal and unemployment rates. The security of copper telephone cables (the disappearance of which has "disconnected" many schools from the telecommunication system) is also at issue.
- In 1996, 62% of the schools were without telephone access. However Telkom's licence requires them to supply links to most schools (if not all) before 2002.
- Teaching staff do not know how to use and integrate the Internet and multimedia PCs into their class work. This is a very serious problem and will have to be centrally addressed, especially at the level of teacher training and retraining.
- There is a lack of understanding of the use of the Internet as an essential part of any school education administrative system, whether on the national, provincial, or individual school level. Again, this issue must be addressed by studying all the possibilities and implementing them systematically.

There is a very active group of schools in the Western Cape Province that sets the example of Internet connectivity in schools as well as

establishing formal relations among themselves to support each other. They also assist other schools that want to connect by offering hardware and software training and advice, as well as moral support along this very difficult route.

St Alban's College

St Alban's College is a large private school in the eastern suburbs of Pretoria. It has a proud academic tradition, now augmented by a proud tradition in telematics, multimedia, and web technology. The school has successfully integrated modern educational and telecommunication technology into the school system as a result of the foresight of the management structures of the school, driven by the vision of a few individuals.

The school has a Director of Technology and is excellently furnished with all kinds of electronic and telematic equipment. There are well-designed computer laboratories that form an integral part of the school education system. St. Alban's also reaches out to the community around it, especially to the underprivileged parts. Details of the school can be found on their excellent Web site at *www.stalban.pta.school.za*.

Project TECSAS

Some years ago St Alban's realised that the Internet was going to be one of the major enabling factors in South African education. When the problem was analysed, the school realised that even when any other school managed to become connected to the Internet (by whatever means) there were no typical South African educational materials to support any kind of school activity.

The school knew also that there are many poorly qualified teachers in the educational system. The logical step was, therefore, to make a contribution that would serve the entire country and create a database that could be accessed by everybody with access to the Internet—both in South Africa, as well as abroad.

Project TECSAS, Technology Education Curriculum for South African Schools, was born. A database was started with educational content, customised for the South African situation, for assisting teachers to prepare lessons, students to work in collaboration with the teacher, and students to work in the absence of any teacher.

Originally, it was the ideal to set up a massive database containing all the material needed to teach and learn Accounting, Economics, Geography, Design Technology, Life Skills, Entrepreneurial Skills, Biology, Science, and Mathematics for the school years Standards 7 to 10 (grades 9 to 12). For this purpose, a pilot project was set up with funds from the InfoDev programme of the World Bank. Since the funds were not adequate to cover all the subjects, it was decided to implement only the Standard 7 (grade 9) database for Biology. It was felt that Biology is a very visual subject that lends itself very well to Web design. Moreover, there is a great interest in the subject from the side of the previously disadvantaged part of society.

The school Web site provides more details of the project and displays the database very well, proving that this kind of interactive data warehouse can work and can deliver a real service to teachers, pupils, and parents.

Student response

The pupils like the approach of an interactive data warehouse very much, since it gives them control over their own progress. Above all, they like to study at a school where the general atmosphere is of modern information and education technology and where they know they are learning the skills that will ensure them jobs in the new information and telecommunication age.

Problem areas and conclusions

- One of the problems experienced by the site developers is the perennial question of copyright. It is easier to make copies of

drawings from textbooks, and also much less expensive than designing the drawings over again. This was solved by a formal agreement between school and publishers.

- It is very expensive to develop a data warehouse and it is virtually out of the range of affordability of a single school. What is needed is a collaborative effort of many institutions, including the education authorities and industry. What the site proved is that it is possible to build such a data warehouse for the benefit of the country, that it works very well, and that an effort must be made to expand it. What's more, a collaborative effort strengthens the indigenous nature of the material, reaching out to local pupils and teachers.
- Many teachers are afraid of the formal HTML requirements to develop Web pages. The Council for Scientific and Industrial Research (CSIR), through its MICOMTEK Division, has created a software curriculum management tool that enables teachers to prepare their own material and to deposit it on a Web site for the use and benefit of all (sponsored by infoDEV and the IDRC).
- The interaction with peers is very important in this field. Isolation is deadly! St Alban's is at present starting a Connected Learning Community, where people meet. Local and international schools and organisations meet on common virtual ground. More information about this new school activity can be found at the Web site *www.stalban.pta.school.za/beyers/microsoft/clc98.htm*.

A new type of school emerging

St. Alban's typifies the kind of school (independent or public) that is emerging in South Africa. The acquisition of and expertise in educational and communication technology is not left until the education authorities take the lead; the schools are making their own decisions. They have a vision to use the equipment to give their pupils a better education, one that is relevant in the modern age. Such schools find the funds not only within their parent associations, but launch projects to generate the funds, and even work out laudable projects and apply for grants from NGOs and local and international donors.

St Alban's is an independent school and not in the "rich parent" bracket. The ways in which it obtained the funds are open for any school to follow. All that is needed are a handful of knowledgeable and visionary enthusiasts and a sympathetic school management.

Gauteng teacher training

The Gauteng Provincial Education Department has about 10 teacher upgrading and resource centres. These will be connected to the Internet and teachers trained by using the connection. This is an experiment that can lead to better communication between teachers in various parts of the province. Teachers will be able to exchange information and methodology. This exchange of information is especially valuable in the case of the upkeep and servicing of hardware and software, where peer-to-peer teaching is extremely fast and reliable.

Commercial Organisations

Several commercial telematic firms were started during the last decade with the express purpose of providing affordable telematically based tuition to the nation. None of them actually got going well enough to become commercially viable. Some of them are now renting their services, studios, and sites to other educational institutions, or even to loosely bound conglomerates of institutions. Some of them provide services to big companies for staff training.

All of them used satellite TV programmes from a central studio in the Johannesburg area and downloaded sites dotted all over the country. Each site had a satellite reception antenna, a signal converter to unscramble the signal for paying customers, a touch pad or a telephone pad to communicate to the main studio where the teacher could see the responses of the individual students, as well as the course statistics. There was also a telephone for audio communication with the teacher. The system claimed to be fully interactive, although in reality the interactivity was very low and at best, disjointed.

The lesson that can be learned is that accurate market research must be done before such commercial ventures are undertaken. The technology used is adequate, but society and the educational community were not ready for such a "revolutionary" approach. It was a far too expensive venture to draw in the masses, and it is clear that small-scale ventures with risk capital will not gain enough support to be viable. What is needed, is the following:

- To fully fund and launch a massive telematic project
- To train the teachers and the users thoroughly before the launch
- To install equipment that is very easy to download
- To design the lessons and the accompanying course material (including printed material) well and to set up well-functioning distribution modes for it
- To use a language that is easy for classes at the distant download sites to comprehend (including vocabulary, pronunciation, and language complexity)
- To fully liaise with the formal education community
- To mount a massive advertising campaign to increase the awareness in the country

Industrial Organisations

There are not many industrial organisations within South Africa that have very big telematic and virtual training programmes. Two main examples are the South African Transportation Services and Telkom, the South African Telecommunications Company. Only Telkom is presented here.

Telkom Skytrain

Telkom, the only allowed South African telecommunications supplier, is a massive organisation with 58,000 employees, many of whom who need training or re-training. To meet this need, over the last two and a half years a massive telematics effort was made, under the name of Skytrain. This programme augmented the face-to-face training methodology of Telkom.

Skytrain is managed from the very well equipped central studio at Midrand near Johannesburg. It involves an uplink in the Betacam SP format to the Intelsat 704 satellite positioned at 66°E (see discussion earlier) on the Ku band (S3 footprint), using only about 8 megahertz of the 27 megahertz bandwidth. The satellite downlinks to about 100 interactive classrooms dotted all over the country. Telkom tries to locate a downsite not more than 100 kilometres from a conglomerate of work locations. The total cost of the system is probably in excess of R50 million Rand (US$9 million).

Each downsite classroom is able to accept data, video, and audio via the satellite while it is in contact with the management console in the main studio. There are on average about 10 work places at each site, equipped with a One-Touch Pad for educational communication with the lecturer. The type of communication is very learner-centred and provides real-time feedback to the lecturer through computer software. Each downsite has facilities for recording videos for reviewing purposes. Tests can be written, using

multiple choice questions. There is a fax machine at each site as well as a number of PCs for computer literacy training; some of them linked to Telkom file servers.

Telkom's trainers at their other training sites produce the learning materials for Skytrain. Each presentation is videotaped for training the trainers and is analysed for effectivieness and standard.

Skytrain is very conscious that presentations must be very well focused and prepared. This means that training of all involved is essential to prevent the "technology or bust" phenomenon.

Skytrain feels that short courses with very clearly defined goals, agreed upon by managers, supervisors, and presenters, are ideally suited for the technology. If done well, Telkom saves on travelling, subsistence, and dislocation costs. The system is ideal for training people who work at the typical one-person stations in the remote areas of the country. These key people can normally not be released to attend long training courses far away from their stations.

Supervisors and managers can easily attend any presentation at any site to anonymously verify that the training is up to standard and that the learning objectives are satisfied. In fact, Telkom is assured in this way that trainees will have the required level of competency to fulfil their changing job needs. This is hardly possible at ordinary training sites.

The Skytrain system is ideal for training and re-training in areas of technology where the development rate outstrips the company's ability to operate "normal" training courses. Students have the advantage of being lectured by international experts in the fields. Training time is also found to be considerably reduced, due to more focused activity during transmission. This system seems to provide solid motivation for the students, who feel that they are receiving state-of-the-art training in their jobs. In addition, training can be done using the "just-in-time" principle.

Broadcasting Organisations

The three main TV broadcasting companies in South Africa are the public broadcaster (SABC) and a new commercial free-to-air channel (ETV), and the privately owned subscription based company (MNET). The SABC has an active educational TV and radio programme schedule, which is briefly reviewed here. The very many satellite channels of MNET carry a great variety of materials that are educationally important. This is especially true for its children's programmes.

The SABC has the obligation to concern itself with formal education in particular and educational programmes in general. It is actively collaborating with the national Department of Education (Centre for Educational Technology and Distance Education).

There are very many interesting programmes that are broadcast to support the senior school syllabus. These lessons have huge audiences and are subsidised by Liberty Life Trust. Talented and knowledgeable teachers are used, and children are allowed to phone in with problems that are dealt with in live sessions.

Some newspapers, like the *Sowetan*, independently carry printed class notes that enhance the TV programmes. Together the TV and the printed notes make an enormous contribution to the training of pupils in science and English.

The main problem with this kind of one-channel TV lesson is that of getting the school timetables of all the provinces and all the schools synchronised. It is an almost impossible problem, and the result is that programmes are recorded, thus nullifying the effect of the minimal interactivity.

The South African Institute of Distance Education (SAIDE) has just released a report to the SABC on its educational role and how it may enhance its effectivity in this regard. The massive report can be viewed at the SAIDE site *www.saide.org.za*.

Based on SAIDE's research, the SABC Education Department, together with the national Department of Education, has developed the School TV service, which is designed to offer programmes to the Reception and Foundation Phase (grades R to 3) in support of learning and teaching. However, this service is going beyond broadcasting the programmes. It is also focusing on delivering print support materials to schools to complement the programmes, together with efforts to train teachers on using the media, and assisting with the delivery of receiving equipment (TVs and VCRs) to schools.

The SABC Education Radio and TV Departments offer programmes that support all sectors of the education and training system. These include Early Childhood Development, Primary and Secondary School, Teacher Development, Science and Mathematics, Agriculture, Youth Development, Culture of Learning, Teaching and Services, and Adult Basic Education and Training.

The African Virtual University (AVU): A Representative Example

Africa is a vast continent with a fast-growing population, having an abundance of natural resources on the one hand and an almost universal set of struggling economies on the other. This vicious interplay between population and economy tends to push the population growth upward and the economy down in most countries. One of the results of this interplay is the education system syndrome of most countries: too little funding to address the basic problem that most of its citizens are illiterate in all modern meaning of the word. Too few resources have to stretch too far.

If a system of education could be developed that allowed widespread tertiary education per subject in several countries at the same time, it would mean that expensive resources could be shared and the economy of scale of a group of countries participating would offset the inevitable increased costs of presentation. To put it bluntly, if a group of countries could be induced to share the delivery of lectures via satellite by knowledgeable world-class lecturers, supported by good ground staff, all of them would benefit. The African Virtual University (AVU) tries to do just that.

Objectives of the AVU

The objectives of the AVU are simply this:

- To use modern telecommunication technology (especially satellite TV technology) in diverse countries in Africa to demonstrate that it can be used effectively as a teaching medium.
- To prove that such a project can be successfully implemented in various African countries, each with its own government, educational system, independent universities (jealously guarding their academic freedom), telecommunication authorities (jealously guarding their airspace), language, and culture.
- To prove that such a project can generate the economy of scale to sustain itself after the inevitable discontinuation of donor funding.
- To upgrade the capacity of African countries in teaching mathematics and science, subjects that are very much needed to kick-start their economies.
- To prove that diverse communities can easily adapt to the modern technology, that is, that such communities can leapfrog the paper age.
- To prove that diverse university curricula and timetables can be subjected to the dictates of common sense and usefulness.

The pilot project

The pilot phase implementation, beginning in July 1997 and lasting one year, involved six English-based undergraduate courses of televised instruction taking place from sites in the United States, Ireland, and Canada to appropriate sites at African universities. Simultaneously, French-based courses were developed in Belgium, France, and Switzerland. (The next phase will activate Portuguese-based courses; the Portuguese Web site is under construction at present.) Formal contracts with U.S. and European universities to provide the teaching for the courses as well as the background material (called "literature") were negotiated and signed. (All data and information quoted below come from the Web site of the AVU at *www.avu.org.*)

The pilot project was intended to involve small teams in Africa, supported by a small core team at the World Bank supported by consultants. Twelve higher education institutions from six Anglophone countries (Ethiopia, Ghana, Kenya, Tanzania, Uganda, and Zimbabwe) participated in the Anglophone part of the project. These institutions are:

- Addis Ababa University, Addis Ababa, Ethiopia (AAU)
- Kenyatta University, Nairobi Kenya (KU)
- Makerere University, Kampala, Uganda (MUK)
- Uganda Polytechnic, Kyambogo, Kampala, Uganda (UPK)
- Uganda Martyrs University, Nkosi, Uganda (UMU)
- University of Zimbabwe, Harare, Zimbabwe (UZ)
- National University of Science & Technology Bulawayo, Zimbabwe
- Open University of Tanzania, Dar-Es-Salaam, Tanzania
- University of Dar-Es-Salaam, Dar-Es-Salaam, Tanzania
- University of Science & Technology, Kumasi, Ghana (UST)
- University of Cape Coast, Cape Coast, Ghana
- University of Ghana, Accra, Ghana

Eleven institutions from six Francophone countries (Benin, Burkina Faso, Cote d'Ivoire, Niger, Senegal, and Togo), as well as two institutions from two Lusophone (Portuguese speaking) countries, participated during the equipment installation phase. The institutions from Francophone countries are:

- Université de Dakar, Senegal (receive site installed)
- Université d'Abidjan, Cote d'Ivoire
- École superieure polytechnique de Yamoussokro, Cote d'Ivoire
- Etablissements Loko, Cote d'Ivoire (biggest private educational institution in the country)
- Université de Lome, Togo
- Université de Cotonou, Benin
- Université d' Ouagadougou, Burkina Faso
- Centre universitaire de Bobo Diou Lasso, Burkina Faso
- Université de Niamey, Niger
- Université de Nouakchott, Mauritania

And the institutions from Lusophone countries are:

- Universite Eduardo Mondlane, Mozambique
- Cape Verde Higher Education institute: request received from the Ministry

The courses offered during the pilot phase were very limited. They are, however, essential science courses that are really needed on the African continent. In the second semester, there were three additional courses, with a further seven

African universities participating. The registration figures for the first two semesters (available on the Web site) show the courses fulfil a need and draw reasonable numbers of students. The remarkable fact is that so many institutions in various parts of the world managed to collaborate in real time to fulfil a real need.

Funding of the project

The World Bank was one of the sponsors of the pilot project. World Bank Africa Region and its *info*Dev activity contributed US$750,000, other bilateral donors contributed US$925,000, and the U.S. Trade Development Agency contributed US$365,000. The full pilot project financing was about US$3 million for the period July 1997 to July 1998. The satellite transmission time seems to have been donated free of charge for the duration of the pilot project.

It is not easy to estimate the costs of the pilot project. The AVU planning document states the following (see *www.avu.org*):

> A conservative estimate of the cost of international satellite transponders is in excess of $2 million per year for four digital channels (half transponder capacity on a long-term lease).
>
> All other costs of operating the AVU on an annual basis are estimated at a multiplier of three times the cost of transponder access (based on the operating budgets of other satellite-based distance learning networks, but adjusted by a significant increase for course development and production, student support services, and international operations).
>
> It is currently planned that the AVU will broadcast on four digital channels the 1999 and 2000 academic year. With 286 credit courses planned for the year 2000 at an estimated transponder cost of $1.92 million per year, it will take only 269 students paying $25 tuition per course in the 286 courses to cover the most significant cost to be incurred by the AVU, or an average of only one student per site among the projected 260 sites. In the year 2001, the full transponder cost will be an estimated $3,000,000 per year, and with an estimated 442 credit courses planned, it will take 272 students per site paying $25 each to cover the transponder cost. Retaining a site count of only 260 sites, the average number of students required to cover the transponder cost is still only approximately one student per site per course.

Some conclusions

Probably the most important findings are that it is possible to:

- Set up a virtual university in Africa, using very advanced communication technology.
- Obtain collaboration on state level and on university level between different African countries (and also overseas countries).
- Synchronise the same courses in the timetables of the different universities in the different countries.
- Use well-qualified lecturers in more advanced countries to deliver the courses.
- Train local staff in assisting these lecturers at local sites.
- Use the most advanced technology without losing the students who are not used to the technology.
- Use a common language (English) to deliver the lectures without any real communication problems.
- Prove that the operation can be financially viable, even in such esoteric subjects as mathematics because of the economy-of-scale effect, summed over the various download sites.
- Prove that the technology is stable and that its equipment can be used over long periods in non-industrialised areas of Africa.

- Prove that it is one of the ways in which to accelerate the production of graduates in subjects that are difficult to teach at the level of single states because of the lack of suitably qualified staff.
- Prove that this technology and methodology can be extended to other subjects and fields of study, for instance, the medical direction, since Africa urgently needs more qualified doctors, nurses, and health officials.
- Prove that Africa can leapfrog the paper age into the information technology age without showing any signs of stress and strain.

These are remarkable findings indeed.

Some Other Representative African Examples

Egypt

Egypt is situated on the northern part of Africa and has a progressive government that is anxious to improve the telecommunication capacity of the country. The overall connectivity in the country is not high, but the government has launched a few telematics and PC projects. Although there are as yet no real virtual institutions identifiable on the Internet, Egypt has an emerging interest and will most certainly improve during the next few years. Egypt is judged to be at the stage where virtual activities can be confidently planned and developed from existing multimedia projects described below.

Telecommunication infrastructure

Much state and donor funding has gone into telecommunication upgrading projects, but the telephone connectivity density is still low, running at an average of about 5%, while Cairo and Alexandria have a connectivity of around 12% (according to Jensen). The ideal is to develop full connectivity around the year 2010.

Furthermore, there are a quite a few Internet service providers operating in Egypt, giving excellent usage and enhanced services to their customers. According to Jensen:

> Internet service provision is divided into three groups: IDSC is responsible for government users, EUN is responsible for the academic and research network, and RITSEC is responsible for the private sector. RITSEC is establishing a VSAT network in the country in cooperation with the PTT and VSAT equipment suppliers Hughes and NEC.

The Egyptian Universities Network

The Egyptian Universities Network (EUN) has established the FRCU Computer Centre. The EUN connects academic and research centres, together with governmental and non-governmental organisations to the Internet. Jensen (in his Web site) notes the types of services made available through the EUN. They are:

- Internet and EARN (TERENA) administration for Egypt.
- Networking connectivity to different sectors.
- Full Internet services (e-mail, remote log-in, file transfer, Gopher, WWW, Lynx, Mosaic).
- General and specialised training courses and documentation on different networking areas.
- Consultation and assistance for building and enhancing networks.
- Assistance with installing and programming scientific or statistical packages.

Virtual institutions

Although no virtual institutions could be found by searching the Internet, and no Web masters in Egypt replied to e-mailed questions about such activities, the Egyptian Ministry of Education has started several projects that have the ability to develop eventually into virtual teaching activities. These are described on the Web

site of the Ministry of Education under the project title: positive education. (See *www.frcu.eun.eg/www/homepage/moe/newsite1.htm.*)

The vision of the ministry is to bridge students to the 21st century through "positive education." The Web site gives some examples to illustrate what this positive education is. The following set of conclusions was drawn from a close study of the Web site and the examples given. The ministry did not respond to e-mail inquiries. The trends are, however, clear.

Positive education seems to be multimedia education, and it is clear that it will first be introduced at some schools, while others will follow as they become technologically equipped. It is not clear whether the scheme is network-server based, runs on isolated multimedia PCs using CD-ROMs, or is Web based. Whatever the status, it is clear that it is only a small step to virtual education via the Internet. A series of Web pages about a history course for the first year primary and the first year secondary students are provided on the site. They provide some good examples for a geography course and a social studies course.

The institute called GAEM is starting a massive project of producing multimedia programmes in social science, physics, chemistry, and biology. The project aims to cover all subjects in the school curriculum in Egypt. A very clear timetable is available for this project and it is starting to unfold. Some Web pages from some courses are available on the Web site, and judging by their quality (design, graphics, and text) the courses are of a very high standard and excellent quality. One of the first things that jumps to the eye is that the Arabic script makes it very easy to design compact and beautiful Web pages. The computer-generated calligraphy is breathtaking, and the design of the pages reminds one of the Old Egyptian design saying: text, graphics and colours are integrated aspects of one and the same thing.

Up to the present about 150 schools from all the governorates (provinces) of the Arab Republic of Egypt have joined the project.

It is clear that Egypt is moving ahead in trying to reap the benefits of the information and computer age. It is but a short step from the multimedia set of school syllabus contents to full Internet-delivery of study material to schools or to individual learners. In any case, the pages exhibited on the site are obviously designed to be suitable for Web downloading. It will be of interest to follow the further development of this project and its conversion into a virtual teaching and learning situation.

Morocco

The telephone penetration of Morocco is around 4%, but it has a relatively good telephone network, X.25 service and ISP sector. Morocco is planning to increase spending on the improvement of this sector in the next five years, and it is a member of both INTELSAT and ARABSAT. It may thus be ideally placed to launch extensive ventures into virtual education, using modern telecommunication and information technologies.

Morocco also plans to upgrade the digital lines from 90% to 99.5% and install fibre-optical networks in the inter-urban areas connecting most cities. (See the Jensen site at *www3.sn.apc.org/africa/morocco.htm* for more details.)

Morocco has an analog cellular network (with about 9,000 subscribers) and a digital CSM cellular network that planned to double its 1994 subscribers to 24,000 in 1995; it is probably much more at present.

According to the latest count, there are 150 commercial ISPs operating in Morocco using the telecommunication backbone of the country (see *www.pnud.org.ma/fnuap/morocco.htm*). There is a fair number of Moroccan sites on the Web, spanning government, education, universities and training institutions, and learned societies. However, the level of detailed information they dispense is

rather low. Such a list is found on the above-mentioned site.

In spite of an intensive Web search, there was no evidence of any teaching activity that may lead to the establishment of a virtual teaching institution—not even on the Web site of the Ministry of Education at *www.dfc.gov.ma* (in French). However, there is evidence of the use of PCs and computers at contact teaching campuses, for instance, at the site of the High Tech School at *www.hightech.edu* (in French). This institution allows its students to put some of their projects on their Web site, indicating a reasonable level of interest and expertise in Web-related matters.

It seems that the infrastructure for virtual teaching activities are beginning to become available in Morocco, but that the connectivity is still too low to make any activity economically viable.

Zimbabwe

Zimbabwe is a vast country with a relatively under-developed telecommunication infrastructure, except between the major centres. There are areas of severe problems, such as long waiting time for connections and low reliability, especially for trunk calls. There is an X25 network available in four major centres.

There is no formal government policy for developing a national information infrastructure. The Research Council of Zimbabwe has recently started supporting an academic and research network in the country with funds from UNDP's SNDP programme.

The Jensen site *www3.sn.apc.org/africa/zimbabwe.htm* states:

> Iafrica/Data Control was the first full Internet provider in Zimbabwe, setting up its own leased line to its South African parent company UUNET Internet Africa (*www.harare.iafrica.com*). Two other ISPs, Samara and Interdata, started services shortly afterwards, also establishing leased lines to South African ISPs (*www.samara.co.zw* and *www.id.co.zw*).
>
> Last year the PTO, ZPTC, contracted Global-One to establish a large-scale national Internet backbone with a 256kbps link to the United States and a POP in the four major cities for resale to the private ISPs. Accounts on the system are sold in blocks of 20 to each ISP, which then resells them to the end user. Since the start of the service, the link was upgraded to 1Mbps and a further upgrade to 2Mbps took place in mid '98 with the addition of a 1MB link to Teleglobe in Canada.
>
> The PTC has established a special tariff for calls to the Internet backbone, which are charged at the cost of a local call plus 20% for calls from anywhere in the country.

There are some e-mail services available in Zimbabwe, sometimes through South African organisations via the University of Zimbabwe (that has a campus network).

Distance education

Zimbabwe is very much interested in distance education and has a small initiative. The University of South Africa is also very active in Zimbabwe, especially the Business School and the Faculty of Economics and Management Sciences. However, there are no discernible activities that can be classified as being dependent on the local telecommunication infrastructure. The University of Zimbabwe, however, is participating in the African Virtual University project. The National University of Science and Technology (NUST) in Bulawayo is a focal point for the Regional Information Networks for Africa (RINAF) project.

Some conclusions

The following conclusions may be drawn:

- The telecommunication infrastructure in the country will have to be greatly upgraded before any enhanced education can be successfully undertaken, unless it is of the kind represented by the African Virtual University;

- A central programme of developing a national information technology infrastructure is a pre-requisite for any enhanced educational activity, even within the boundaries of local university campuses.

General Conclusions

The everyday and "customary" operations of the departments of education and governments of most countries on the African continent mostly create a budgetary vortex that dominate their spending pattern. There is, inevitably, very little money left over in most national or educational budgets for expanding and upgrading telecommunication networks, computers, etc. This means that telecommunication and information benefits will never reach most of the population of Africa if this traditional pattern is not changed. If the day-to-day problems and operations are not addressed through the systematic and planned use of ICT to empower the population into a new economic reality, the situation will inevitably become worse.

One of the main problems is that people who formulate policy are not adequately informed about general aspects of the information, computing, and telecommunication ages. This means that they can never develop a new vision. To put it bluntly, what is needed is reschooling of most of the governments in Africa to make them really appreciative of the technological future.

Telecommunication infrastructure limitations

In spite of adequate international telecommunication links, especially in those countries linked to undersea cabling, the national infrastructures of African countries do not seem to match up with that demanded by the information and telecommunications age. The telephone coverage is far to low in most countries to make any telematically enhanced education economically viable. However, there are signs that Africa as a whole has awakened to the demands of technology, as the examples of Egypt and Morocco show. There are other countries, such as Kenya and Zambia, which are developing very fast in this regard.

There are several important factors that need to be addressed before any virtual universities and other education institutions with a significant range of activities can be set up:

- Old networks and backbones still in place all over the continent are inadequate since they were not designed for the modern telecommunication age and its requirements of bandwidth, stability, and continuous service.
- Policies and tariffs of some governments and their monopolistic telecommunication authorities may cause telematically enhanced educational projects to flounder because of high transmission costs.
- Linking telecommunication and data lines across national borders is problematic for virtual institutions since it has to contend with too many imponderables, such as a concatenation of different national policies and tariffs.
- Telecommunication networks often reach only the cities and larger towns in many countries. The depth of telephone penetration is far below that expected of a country that wants to join the information age.
- Governments in general do not have a fully developed and fully funded telecommunication plan to bring the benefits of the information and telecommunication age to their populations.

Computing infrastructure limitations

A good virtual education institution presupposes the presence of a very good computing centre,

stocked with adequate computers, servers, networks, and personnel. In addition it should have adequate bandwidth available to communicate with the outside world.

However, computers, PCs, and other computational and networking infrastructure are still regarded as a luxury in most countries on the continent, and most do not have a policy to systematically expand the computing and networking capacities of their universities and other education institutions to ensure that they become competitive in the modern age.

Database limitations

While the database system of the University of South Africa made it possible to create a mega-university that can use the economies of scale, very few other African universities have developed such databases.

The size of the database is not important. What is important is its design, its servers, the consistency of the data captured, and the ways in which it lightens the administrative load of staff and students. This means that a systematic training programme of African institutions in the use of, design, and implementation of databases is of the utmost importance.

Administrative limitations

It seems that most educational institutions on the continent do not really mine the benefits of the telecommunication and information age to improve their administration. For instance, e-mail on campuses mostly does not form part of the "way of doing things." The reasons for this are simple: lack of infrastructure combined with a lack of operational know-how and technological expertise. Education authorities usually have not yet had a chance to develop the new vision of the future discussed above.

Internal network limitations

Very good internal networks (LANs and WANs) are essential for any institution that wants to "go virtual." It seems that many African institutions do not have adequate internal networks with 100% staff connectivity.

Satellite transmission technology will partly offset the lack of such a structure, but eventually it will become a necessity. Every university will probably need to be managed via an Intranet using modern office technology.

Servicing limitations

Good hardware and software service centres are usually found only in the main cities in Africa. This is a very serious constraint for the development of virtual institutions and needs careful attention. Any system that serves any part of the education stream of a virtual institution that is "offline" for whatever reason, or whatever period of time, is a serious hurdle for any student or lecturer to overcome. The more often a system is offline, the more serious, debilitating, and permanent are the results.

Internet limitations

Most of the bigger and better universities in Africa are now connected to the Internet, or are in the process of being connected. But the lack of good "pipes," ISPs, computing and network equipment, national telecommunication funding, cause many other education institutions not to be connected.

As well, although the use of the Internet is increasing by leaps and bounds, there are still many difficulties to overcome, especially for off-campus students who need to access their universities through the Internet. ISPs are often not available and telecommunications are not dependable and are mostly very slow.

Financial impacts

Setting up the required local educational institution infrastructure is mostly impossible within the bounds of normal budgets. The usual pattern is to experiment, but often this is where the modernisation stays because there is no funding to extend the experiment to all education institutions What is required is a systematic rethinking of the funding process of such institutions. Minor cosmetic surgery is not going to be of much benefit.

This difficulty is made clear in the descriptions of the University of South Africa, the University of Pretoria, and the Technikon SA given above. These institutions are all in the process of rediscovering new ways of budgeting to accommodate their vision of the information and telecommunication future.

Human resource requirements and training

Human resource training forms one of the pivotal problems that must be addressed. As was emphasised above, a special effort must be made to train the rulers in government, civil service, and education.

Learner and teacher acceptance

Where such schemes exist for a long enough period in Africa, there was no evidence at all that learners were not able to master the demands of technology. In fact, the reverse is true: learners have no problems working with the most advanced technology and accepting it as a teaching and administrative medium.

Teacher acceptance is generally limited by training available. For example, in the University of South Africa, the rate of teacher acceptance is low because of the lack of training in the new media, as well as the lack of funds to acquire the necessary PC configurations. The African Virtual University, on the other hand, has managed to overcome the problem.

Reactions of conventional institutions

Most conventional institutions in South Africa and elsewhere are making huge efforts to implement these technologies into their own teaching. In most cases, this also includes the enrichment of their contact classes with Web-based technology and other telematic technologies. This is one of the most exciting aspects, namely, that contact teaching universities are moving into distance teaching, where the "distance" also includes their own campus-based students.

General demographic characteristics of learners

Most of the learners being served by the new technologies are either urban (where the telecommunication infrastructure is good) or are campus-based (where the technology is under the control of the institution itself). There are very few signs that any country has mastered the transition to the mass model that is so seriously needed on the African continent.

Involvement of industry and commerce

There are few signs of the involvement of commerce and industry in the development of virtual training. It must not be forgotten, however, that industry and commerce are not as well developed on the African continent compared to other regions of the world. There are also virtually no indigenous ICT firms on the continent, except in the case of South Africa where they make a modest contribution.

There is also no common educational support plan (as far as known) between the major international software and hardware companies so that their efforts can mutually enhance one another.

8 Virtual Institutions in the Indian Subcontinent

(Including Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka)

DR. SUGATA MITRA

Introduction

The Indian subcontinent consists of several countries with a total population of over one billion, making up 20% of the population of the world. Most of the area has been repeatedly invaded in the past 3,000 years. These invasions have originated mostly from western and eastern Europe, eastern Asia and, occasionally, from China. This has resulted in a uniquely heterogeneous culture that combines races, religions, languages, beliefs, and values. The education system has continuously grappled with this problem of heterogeneity and has undergone many transformations, from the early Hindu systems of private education to the centralised universities of the Buddhist and Mogul periods, to the most recent model, the British systems of the early 20th century. It is in this larger historical context that the use of educational technology in the subcontinent should be viewed.

This report is concerned with virtual institutions, which is generally understood to mean institutions using the Internet to deliver programmes. However, this report also includes facts on the use of media in general for the purpose of education delivery. In this report I discuss the current status of the computing and electronic infrastructure in the region, Internet accessibility, and the available media. I also cover the nature of virtual institutions in the region and their experiences with media-based education. Online activity in the region is an indicator of the potential of virtual institutional methods, and that topic is also explored. Finally, I have tried to predict some future needs and trends in this region.

Computing Infrastructure

The earliest use of computers in the region dates back to the early 1950s when the first computer was installed in the Indian Statistical Institute (ISI) in Calcutta. The ISI continues to remain one of the pioneering institutions of this region in the area of computer science research. Computer usage remained restricted to universities until the early sixties when IBM introduced commercial computing in the region.

In the late seventies, IBM was forced to cease operations in India due to government regulations regarding the dilution of foreign equity. This resulted in creation of a local computer industry that continues to thrive today. The largest of these corporations is the HCL Corporation (the erstwhile Hindustan Computers Limited) that has grown to a billion-dollar multinational in the last 15 years. It is interesting to note that this phenomenon did not occur in the other countries of the region where IBM continued to provide most of the hardware.

Hardware

At present all international brands are allowed to operate all over the region. Bangladesh has recently exempted all hardware from customs duty, while duties ranging from 10% to 50% exist in the other countries. IBM PC compatibles are the most commonly used computers in government and private industries as well as in homes.

There is a flourishing "grey" market for PCs assembled by small local companies, or even individuals, and this benefited the consumer, driving the prices down and improving the quality of PCs. As a result, a resident of the region has access to computers that are equal in power and price to those in any other country.

The use of computers in the home is rising sharply, driven by the popularity of the Internet. In India, the total number of PCs, which had grown from zero to about one million in the period from 1980 to 1995, has increased to over three million in the period from 1996 to 1998.

The most prevalent configuration at the time of writing (April 1999) is the Pentium III processor with about 32 megabytes of RAM and 6 gigabytes of hard disk space. Most popular peripheral devices are freely available and include modems, inkjet and laser printers, CD-ROM drives, DVD, and digital cameras. Service quality is poor or absent in the region. However, this is compensated for by the relatively low cost and low failure rate of the hardware.

Software

India is the dominant software producer in the region and is currently considered the world's largest exporter of software. This phenomenon is not very clearly understood, but is probably related to the English language, mathematics, and computer skills provided in the country at the school level. These factors, coupled with the large numbers that are common to India, result in a large talent pool that has become crucial to the world software community today.

The large companies and the "grey" market confirm that the Microsoft's Windows environment is the most popular operating system, C++ and Visual Basic are the most commonly used programming languages, and Microsoft's Internet Explorer is the most popular browser in the region. Oracle is the most commonly used Relational Database Management System (RDBMS) for new applications development, while FoxPro continues to be the most common for existing applications.

Networking

The use of networked computing environments started from newspaper applications in the early eighties. I was fortunate in being associated with the first of these applications (1983) at the *Patriot* newspaper, New Delhi. Since then, networking has become both very common and, at the same time, a most sought after skill.

Windows NT and UNIX remain the most common operating systems for networking in the region. There is a great shortage of people who can configure and administer such networks, which has resulted in most government departments remaining without any significant computer applications.

The media, on the other hand are great users of networked environments and digital composing is popular from Sri Lanka to Bhutan, in all the countries of the region.

Information Technology Education

There is a severe shortage of trained persons in the region. Table 8.1 describes the current methods of training and the resultant outcomes.

The total numbers of graduates produced from all sources in the region are estimated at 25,000 from the formal (government) sector and around 300,000 from the private sector.

The Indian Institutes of Technology (IIT), a group of six autonomous universities in India, account for the best products in the region. Of the 300 or so students produced each year, over 90% migrate to other countries.

Table 8.1

Problems with Information Technology Education in the Indian Subcontinent

Institutions	Types of courses	Curriculum	Outcome
Major universities	Academic and research oriented	Computer Science and Engineering	Almost all good students migrate to other countries, particularly, the U.S.A.
State colleges	Technology oriented	Tools and applications, outdated hardware and software	Students need retraining by the industry. Good students proceed to other countries for further studies.
Private schools	Application and development oriented	Tools and applications, no standardisation, and many institutions with little or no credentials	Students need retraining or they are unable to find employment.

The Indira Gandhi National Open University (IGNOU) is the largest distance education provider in the region. IGNOU has offered courses in information technology since 1997; however, the results are yet to be tested in the employment market.

NIIT Limited, an Indian multinational education company, is the largest private education provider in the region, accounting for over 150,000 graduates each year through about 1,000 "outlets," which are franchise centres all over the region. Most of the graduates are employed by the local industry.

In spite of these large numbers, there continues to be a shortage of trained people in the region due to rapid growth in the use of computers, both in the government and the private sectors.

Use of computers

Use of computers by the private sector is widespread in the region, with the possible exception of Pakistan, where the data is not reliable.

Computer use in the government sector is very low at this time, but likely to increase rapidly all over the region for two reasons. First, there is increasing demand for information from all sectors and, possibly, an increased awareness of the benefits of having automated information systems.

Home use of computers is relatively low, but is already on and exponential growth path all over the region. The single most important reason for this is the Internet. In India, the number of personal computers has gone up from 90,000 in 1996 to 300,000 in 1997 and is currently on a 44% annual growth rate. There is also a tremendous expectation in the region for the use of personal computers and the Internet in children's education. This has already resulted in a large market for CD-ROM–based products.

Use of computers in schools is relatively less developed. While most schools in the region have computers, few are using them effectively for general education. Most are used for computer education alone, mainly because teachers are not aware of the potential uses. Teacher training in this area is an imperative for this region.

Internet Accessibility

The ability to access the Internet is one of the most important factors in the development of virtual institutions. In many forums held on the subject in the Indian subcontinent, I have found people questioning the utility of virtual institutional schemes that rely on the Internet. The argument posed is that there are too few people in the region who have access. In my opinion, this argument is not a good one for deciding on whether or not to start activities in this area. Resources have seldom affected the spread of a medium in this region. For example, India produces the largest number of films in the world. While it may be argued that in a country that is known for extreme poverty, people would rather

spend money on food than on films, in reality this is not the case. Films are watched in every corner of India by millions of people irrespective of their social or economic status. In fact, one might argue that the virtual world offered by films is sometimes the only relief that the poor have from a harsh and often unbearable reality.

While telephone connections in India grew from zero to 4 million in 40 years (1950 to 1990), cable TV connections grew from zero to 16 million in just 6 years (1990 to1996). (See Table 8.2. and Figures 8.1 and 8.2.) I believe the growth is due to the value perceived in entertainment over other "essential" items. In a study conducted by the Department of Electronics, Government of India, some years ago, it was found that many rural areas ranked a colour TV set as more essential than clean drinking water.

Most lay users perceive the Internet as a source of information and entertainment. The cost of acquiring a PC and an Internet connection at home is about Rs. 70,000 (US$1,600). In addition there is a recurring cost of the phone bill of about Rs. 10,000 (US$135) every year. In a country where the average annual income is about Rs. 6,000, these amounts are not small. The fact that the home PC market is growing at 44% seems to indicate again that the economics of entertainment in the region are not clearly related to incomes.

Table 8.2

Media Estimated in India (1998)

(All figures in millions)

Year	Telephones	Cable TV	PCs	Internet
1950	0.01	0	0	0
1960	0.25	0	0	0
1970	1	0	0	0
1980	2	0	0.01	0
1990	4	0.01	0.25	0.001
1995	6	16	1	0.01
2000	10	30	10	10

Figure 8.1

Top 10 Cable Subscribers by Country (1995)

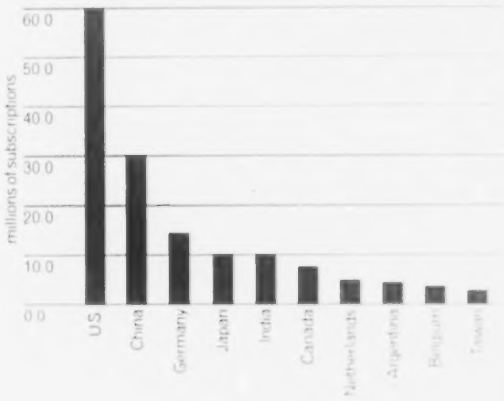
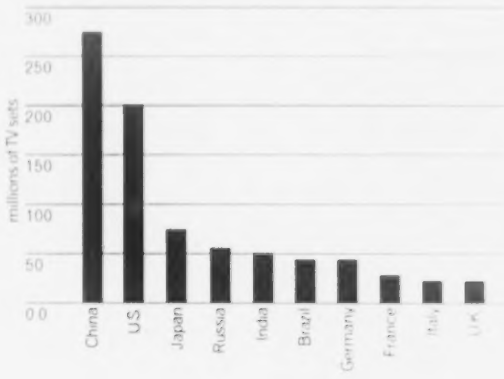


Figure 8.2

Top 10 TV Owners by Country (1995)



Service providers

Internet access is provided in the region by various government and private agencies. Sri Lanka has the largest number of agencies with ten, while India had only one until very recently.

BEST COPY AVAILABLE

Videsh Sanchar Nigam Limited (VSNL), a government organisation in India, is the largest Internet service provider (ISP) at this time. Until recently, providing Internet access was a government monopoly in India. However, private ISPs are now allowed and a large number of organisations have expressed their intention to provide Internet access. Among these are several cellular telephone companies, cellular telephony having been privatised by the Indian government. At the moment, two private agencies (Satyam and Bharati Telecom) have started ISP operations as well as MTNL (Mahanagar Telephone Nigam Limited), the largest government telecom company in the country.

Bangladesh has good quality Internet access in Dhaka, both from government and private sources. The largest is a service launched recently by Beximco, the largest business group in Bangladesh.

Pakistan and Nepal have both government and private ISPs while in Bhutan the government is the only provider at this time.

Bandwidth and telephony issues

Public Internet usage began to grow in the region around 1994; before then its use was restricted to research organisations. Most lay users in the region are not satisfied with the service they receive (based on a short e-mail survey I conducted). The most frequent complaint is that of sudden disconnection of the telephone connection to the ISP (due to the poor quality of lines in most cities). In most cases the problem could be called the "last 100 metre problem." Connections from the telephone pole to the home are usually ad hoc in most cities, resulting in high noise in the connection, often mistaken by modems as a line drop and followed by disconnection.

Increased data traffic due to the Internet has raised the awareness of this issue in the last few years and the situation has improved in most large cities. However, medium and small city users continue to face the problem of disconnection every few minutes. This could become one of the biggest reasons for the Internet not being widely used in the region.

The second most common complaint is that of low bandwidth availability. Most ISPs attempt to distribute too little bandwidth to too many users. However, with the ISP business opening to competition, this problem is likely to solve itself.

Internet in educational institutions

Most universities and colleges in India and Pakistan have access to the Internet. However such access is not regulated well and I have not come across any organisation with a clearly stated policy regarding the use of the Internet. In the other countries of the region, not all higher education bodies have access to the Internet although all of them, invariably, express a desire to use it effectively.

Most affluent schools in the region have access to the Internet and children use these connections often. Once again, however, there is no common policy and a great deal of concern is often expressed by teachers and parents regarding the possible adverse effects of the Internet on children.

Children in large cities with access to the Internet and with some encouragement from the school routinely outperform their teachers and other adults in their knowledge and skills in information technology. In a recent contest organised by Intel Corp. in New Delhi, over 300 children participated in building Internet-based applications. Their choice of and familiarity with cutting edge technology (e.g., Java, Visual Basic, ActiveX, ASP, DHTML, 3D studio, digital audio, video, etc.) showed clearly that "high tech" is no longer the domain of professionals alone.

Such children are also expert hackers. Some governments in the region have noted this and are in the process of setting up their "X-Force,"

a loose collection of children on the Internet for purposes of "information warfare."

Several network security violations have also been reported from the region, which was the birthplace of the computer virus (Pakistan, late 1970s).

Media

The use of media in the region has always been powerful, popular, and effective. At the same time, literacy levels continue to be among the lowest in the world at around 50%. As a result, multimedia holds great promise for educational and information applications in the region.

Newspapers

Every country in the region has powerful newspapers that have affected politics and society in significant ways. Newspapers in English and 17 other languages are read by about 400 million people in the region, according to circulation estimates from the major dailies. All major English newspapers are now published on the Internet in addition to their paper editions. These newspapers are also great users of technology, from networking and digital graphics, to direct-to-plate, high-speed offset presses.

Television

There were about 50 million TV sets in use in India in 1995. The number is now estimated at about 70 million. Broadcasting rights are strictly controlled and the local governments control all the major broadcasters in the region.

The largest viewing audience is in India, estimated at around 300 million people.

Cable television

The Star TV network included this region in its footprint in the late 1980s, giving rise to the cable TV industry in the subcontinent. There was an immediate uproar from the government and the local media, describing the event as anything from cultural invasion to subversion. However, there was tremendous public response to the "foreign" media and a large, unorganised sector developed to provide the technology (i.e., dish antennae, receivers, and amplifiers). The government TV channels rapidly started to lose viewership. This sudden competition forced the government channels to modernise and improve their content.

It is interesting to note that cable TV in the region is no longer considered a social evil, particularly in India. Instead of a "foreign" culture invading India, the large viewership and substantial advertisement revenues from India changed the content of the cable channels. All satellite broadcasts have Hindi content and Star TV, MTV, and VTV have converted themselves into almost exclusively Indian channels. Western channels such as BBC and CNN have also increased their Indian content substantially.

Cable TV is one of the most popular forms of entertainment in the region today. In addition to the entertainment content, they broadcast high-quality educational programmes on BBC Horizon, CNN's Computer Connection, and the Discovery Channel.

While cable TV is freely available in all other countries of the region, it is banned in Bhutan. It is interesting to note that, at the same time, the Internet is available from Bhutan and there is considerable interest in its education potential.

Radio

Radio has been the strongest rural medium in the region since the 1970s. The technology is entirely internalised, and inexpensive hardware and maintenance is available in the most remote and underprivileged areas.

All governments in the region ban private broadcast; the medium is used mostly for entertainment and propaganda. However, some educational content is available for agriculture and health.

There is great scope for improvement of radio programming in the region. The introduction of FM and digital radio would also help in future educational endeavour.

The Internet

As with other new media, there is governmental ignorance about the Internet. This has led to a view that the Internet, too, represents cultural invasion, particularly from the United States. However, public demand is growing rapidly and, given the population size of the region, it is certain that electronic commerce will thrive. This will, in turn, affect the medium.

In India, as in the case of cable TV, it will once again be a question not of what the Internet will do to India, but of what India will do to the Internet.

Virtual Institutions

Virtual institutions in the region can be viewed in different ways, and for the purposes of this report I have classified them into four categories or environments: complete, complementary, supplementary, and governmental.

- *Complete environments* are those that include a complete cycle of instruction from registration of students and education delivery, through to evaluation and certification. In effect, the student or user (in the case of a service other than education) never needs to interact with any entity, human or otherwise, through any medium other than that of the virtual institution.
- *Complementary environments* are those that include one or more virtual components in a physical institutional model. The virtual components complement the operation of the institution and are necessary for a student to complete an instructional cycle.
- *Supplementary environments* are those that include one or more virtual components in a physical institution. The virtual components supplement the instructional process but are not compulsory for completion of any cycle.
- *Governmental environments* are those where physical services related to government activity are either enhanced or replaced by virtual models.

It is difficult to obtain complete information on these environments in the region. What follows are examples of each kind of activity and any other information I was able to gather.

Complete environments

The only complete environment I could find in the region is a virtual institution from NIIT, called the NetVarsity (*www.niitnetvarsity.com*). I originally conceived and built NetVarsity in 1996 and it went online on July 15 of that year. The NetVarsity consists of a server in the NIIT office in Atlanta, U.S.A. connected to a service provider through a T1 link. It was decided to locate the server in the U.S. because it is less expensive than in India. Moreover, the reliability of the Internet link is much higher. The server has operated with almost no down time during this period. It is based on Windows NT and Microsoft Back Office technology. The server and its contents are controlled from New Delhi, India by a team of seven people who constitute the staff of the virtual organisation.

The NetVarsity offers a complete environment in the sense in which this is defined above. After its creation, we had decided to use an "atomised" instructional design consisting of "skillettes" ("Multimedia Design for the Internet," Sugata Mitra, presented at the Parallel Convention, 13th Commonwealth Conference of Education Ministers, Gaborone, Botswana, 1997).

The NetVarsity offers short courses or just stand alone "skillettes" for a price ranging from US$5 to US$25. This resulted in about 10,000 hits per month during its first year. Total revenue to date is about US$7,000 every year. Since this is

not sufficient to maintain the environment, several modifications were made.

The first modification consisted of a link to the NIIT Intranet, enabling faculty from NIIT to interact with each other through a technology forum. This connectivity between 800 teachers spread throughout India has resulted in tremendous synergy and improvement in quality.

The second modification consisted of a providing access to NIIT students for supplementing their classroom education through a site called Tech Edge. This site provides information, state-of-the-art courses, and a query handling service. Currently, 40,000 students use the site.

The third modification to the NetVarsity was the introduction of Microsoft certification courses. These courses are in high demand all over the world as they have a de facto recognition, being authenticated by Microsoft. In the last eight months since this was announced (April 1998), the NetVarsity has earned over US$100,000 from this activity and over 100 people have qualified from the virtual environment.

In summary, NetVarsity is a virtual institution of seven people operating from New Delhi, with a Web server in the U.S. and networking around 50,000 learners and teachers together in a commercially viable manner. It is definitely a model worth watching further.

Complementary environments

The only good example of a complementary environment in the region is the India Gandhi National Open University (IGNOU). The School of Computer and Information Sciences (SOCIS) of IGNOU was the first government organisation in the region to set up a virtual school (*www.ignou.edu*). It is possible to register for several courses ranging from short-term diploma courses to bachelor's degree courses through the Web site. Lessons can be downloaded and interaction is mainly through e-mail.

Instructional material is mainly the same as that used for IGNOU's traditional correspondence courses. However, Professor M. M. Pant, who is spearheading the virtual institution movement at the university, has begun to experiment with courses designed for the Web. Some experiments with online examination have also been conducted. The courses were started in mid-1997 and at present there are 2,200 students registered. IGNOU is likely to start a large project on virtual institution building in the near future, which will be funded by the Department of Electronics, Government of India.

Another interesting feature of the SOCIS experiment is that the entire study materials are given to students on CD-ROM at the time of registration. In effect, the courses are, therefore, free of cost.

Other schools at the IGNOU have also set up home pages. However, these provide merely a convenient way to look at their course offerings. Registrations are not permitted online, mainly due to government restrictions on electronic commerce in Indian currency. However, it is expected that the use of Indian currency credit cards on the Internet will be permitted sometime in 1999, which is likely to have a great impact on virtual education in the region.

Supplementary environments

A large amount of educational material is made available on the Internet by educational institutions from India. For the other countries of the region, as well as for most organisations in India, all that is available are addresses and details of courses. This has little practical utility and is likely done mainly because of the impression that it is "modern" to have a Web site.

It is important to note that while some representation from universities of the region can be found on the Web, there is almost no representation from schools. Some of the affluent private

schools of the region have Web sites, generally created by children. Interest from school principals and teachers is not lacking, but there is a great lack of awareness of where and how things should be done.

Governmental environments

The use of the Internet for government work is a topic receiving attention at the highest levels in all countries of the region, but details were only available for India.

The government machinery in India seems to be close to a breaking point due to bureaucratic procedures and corruption. The need for a fast, transparent, and efficient system is now close to being a survival criterion for the ruling government. As a result, the past few months have seen the formation of several high-level groups, frequently headed by the prime minister. These groups have come up with recommendations that involve major changes in most systems from administration to the judiciary and the information infrastructure. Most of the recommendations are available at *www.nic.in* and are not directly relevant to this report. However, the recommendations concerning the information industry and education are likely to have an impact on the formation of virtual institutions in the region. Some of the policies recommended are as follows:

- All government departments to have active Web sites for information and form filling applications.
- Internet commerce to be allowed.
- A "citizen interface" (multimedia Internet kiosks for public access) to be deployed.
- Education in English to be emphasised.
- Hardware imports to be duty free from 2004.
- Private universities to be allowed.
- Software exports to continue to be tax free.
- Export revenues from the export intellectual property to be tax free.

It is obvious from this list that even a partial implementation of the above will cause major educational and social change in the region.

Online Activity

In spite of the difficulties in accessing the Internet from most countries of the region, there is intense online activity. There are about 200,000 registered Internet users in the region, most of them from India. It is estimated that each registered account is used by an average of three people. In addition, many people access the Internet from offices and public access services.

It is safe to estimate that about one million people access the Internet from this region. Moreover a large number of people work in Europe and the United States, and it is estimated that over a million people of Indian subcontinental origin access the Internet from outside the region.

The activity generated by these two million users can be divided into the following categories: Web pages, e-mail, newsgroups and communities, and IRC channels.

Web pages

Most users, as well as organisations, have Web pages that they create on free servers. Almost all educational institutions in India have Web pages, although this is not true of the other countries of the region, where only the major universities seem to have Web pages.

Most of these Web pages are purely factual and are reproductions of the standard information booklet of the organisation. They are seldom updated.

E-mail

Messaging is the most popular application on the Web. Most users are subscribers of free services such as *www.hotmail.com* and others.

Newsgroups and communities

There are many newsgroups catering to the people of this region and their interests. Of late, a number of communities have started to exchange mail and multimedia. A good example can be found at *www.bengali.org*, a community for the people of eastern India and Bangladesh.

IRC channels

I have not been able to locate an IRC channel devoted to this region alone. This is perhaps because most users are relatively unaware of channels and how to use them. Moreover, low bandwidth connections are not of much use in IRCs.

Future Requirements

While it is clear that there will be a great deal of activity in the region in the area of virtual institutions, a number of developments have to take place for this to happen. In Table 8.3, I have tried to map these requirements in a matrix. The matrix distributes each activity into different categories depending on the need and feasibility of that activity or development.

Conclusion

The Internet will make significant impact on the region over the next few years, and virtual institutions will play a major role. From schools and universities to government organisations and the corporate sector, all entities will have to change their way of thinking about transactions. Organisations with a large physical presence and small Web presence will have to change to large virtual organisations with a small physical presence.

That will be the essence of the information society to come.

Table 8.3

Present and Future Requirements in Virtual Institutions

	Articulated need (Existing market)	Unarticulated need (New market)	Unfelt need (Unknown market)
Product exists	Correspondence education Government information E-mail Video on demand	Net meetings Chat IRC Telephony	Net commerce
Product can be developed	Non-English applications Kiosks and public interfaces	Virtual universities School networks	Rural applications Video conferencing
Product could be invented	Wireless, self-powered kiosks	Web-based monitoring, robotics and diagnosis	Information warfare and security systems

9 Virtual Institutions in East and Southeast Asia

DR. MICHAEL ROBERTSHAW

Introduction

Information for this report has been obtained principally from institutional Web sites following a Web search and from information provided by individuals who have responded to e-mail requests for information. The results presented here cannot be considered as exhaustive or totally representative, as there were major obstacles in trying to communicate with potential sources of information in a number of countries.

Cyber-populations

Of the 150 million people currently connected to the Internet worldwide, even the most optimistic estimates show that only a small proportion (16%) reside in the countries covered in this report. Of these almost 60% of all "cybernauts" live in Japan! Table 9.1 shows the estimated number of Internet users as of February 1999. (Some countries did not even merit an entry.)

Given the relatively low numbers, it is not surprising that the level of activity in the use of the Internet in education is very low in most countries in the region. As would be expected, the level of activity reflects very closely the proportion of users in a country. For example, Singapore and Hong Kong are much more active than China. Institutions clearly need to take account of the ability of their students to participate in the use of a new technology before investing resources into introducing it into its delivery and support systems.

Although the proportion within the region participating in the Internet revolution is comparatively small, the rate of growth is rapid. The number of Internet users is expected to double by 2002, a faster rate than in the West (although the recent downturn in regional economies may not have been factored into these predictions).

If a critical mass of users is required for institutions to decide to begin using the Internet for teaching, then we are likely to see projects starting

Table 9.1

Internet Users in Asia

Hong Kong	850,000
Indonesia	80,000
China	1,500,000
Japan	14,000,000
Malaysia	600,000
Philippines	320,000
Singapore	500,000
South Korea	3,100,000
Taiwan	2,800,000
Thailand	131,000
Vietnam	6,000

Source: www.nua.ie/surveys/how_many_online/index.html

up to test its use in education in the next couple of years. Certainly most of the virtual institutions covered in this report are in their early stages of development or are part of large projects to investigate the use of this medium. There are no well-established virtual universities.

Cyber-languages

A second limitation in the use of the Internet in education is the availability of the software to handle the use of local languages in what is principally an English-language medium. This problem appears to have been solved in a few countries only (e.g., Japan and Korea), and it will be interesting to see how other countries address it. The Chinese-speaking communities, for example, are faced with the difficulty of standardising the character set for Internet activity, and the People's Republic of China is standardising on a different system than Hong Kong and Taiwan.

It is possible that the extension of Unicode to the Internet through HTML 4 may reduce the problems faced by countries without the resources to develop Internet interfaces themselves. Unicode's use of 16 bits for character representation provides plenty of specialised fonts for users to develop language-specific applications without the need for specialised software.

Competition

In those countries where the Internet infrastructure is reasonably well developed, pressure is increasing on local institutions to participate in the use of the Internet in education through the growing number of foreign institutions offering "virtual" courses. The absence of national boundaries in cyberspace removes many of the barriers to international education and provides means by which local education ordinances can be bypassed. The Internet opens up potentially lucrative markets to institutions from developed countries where education funding has undergone radical changes and fees from international students represent a very attractive funding source.

For any institution developing an Internet-based education system for its own students, there are relatively few obstacles to extending the associated services internationally. The numbers participating do not necessarily have to be large, but the cumulative competition from the many institutions entering the field is likely to create a major challenge to the region's institutions delivering off-campus education.

The region has a long history of sending large numbers of students away for education at all levels, and in spite of the growth in national pride in local institutions, many people still consider a foreign education in the West better than a local one. The entrance of prestigious institutions into the distance education market through the Internet is likely to prove serious for the regional development of Internet-based education. Part of the incentive for some institutions to start using the Internet must be to ensure that they can compete against such intruders. Indeed the ease by which any individual with Internet access can subscribe to a foreign, Internet-based course may remove the potential market in some countries before local institutions even start, which may dampen or even remove motivation to develop virtual education.

There is pressure on all organisations to participate in the use of the latest technology. Certainly the region is not immune from the unseemly race to use new technology simply because it is seen as "sexy."

Regional Efforts

The Southeast Asian Ministers of Education Organization (SEAMEO) is composed of nine member countries (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, and Vietnam). While the organisation has a large number of specialist

groups, none is currently working towards an integrated approach to the use of the Internet at any level.

The Asia-Pacific Economic Cooperation (APEC) started planning a virtual university in 1997, although no concrete action appears to have taken place yet.

Progress by Country

China

China and Taiwan have been particularly frustrating to research for the purposes of this report. Even where an institution was identified as a potential user of the Internet, it proved difficult to get details or to read information provided on the Web due to the different fonts used for Chinese characters and the language barrier. In spite of the presence of Hong Kong on CERNET—the main Internet backbone for universities in China—transfer of data was exceedingly slow, often resulting in the system timing out. The only positive information available is news of a joint European/Tianjin University of Technology project to offer nine courses over the Web; however, work is not expected to start in earnest until the summer of 1999.

The Shanghai TV University appears to be presenting four courses over the Web, including the use of sound files to assist students understand English. (Chinese language Web site: *www.shtvu.edu.cn*)

Hong Kong

A Web search for "virtual university" in Hong Kong generates a lot of hits at Chinese University; however, these relate to individual lecturers supporting their face-to-face courses through the Internet (e.g., *www.cs.cuhk.edu.hk/~kkchung/virtual.htm*).

The Open University is currently preparing a pilot to test the use of WebCT in an eventual project to offer over 100 of its courses over the Internet (*www.ouhk.edu.hk/~oliwww/whatnew/webe.html*).

Japan

Japan's work on the use of the Internet in education seems surprisingly minimal given the reported number of Internet users. The language makes it difficult to investigate through Web searches what is actually happening. Individual responses suggest that while the community is enthusiastic in accepting the technology, the Internet is not yet seen as an important teaching tool.

For example, in the Ministry of Education there are passing references to increasing the access to the Internet in schools, colleges, and universities, but there is no direct reference to its use as a delivery channel. The emphasis at the tertiary level appears to be expanding the satellite range for the University of the Air, although there is little information available on this in English.

Korea

Please refer to Appendix 9.1, prepared by Insung Jung of the Korea National Open University, for information on Korea. Of all of the larger countries in this region, south Korea appears to have the most developed national strategy for all levels of education.

Malaysia

- *Universiti Tun Abdul Razak (Unitar):* Unitar was established in 1999 with the intention of providing a mix of Internet-based support for home study and face-to-face support for student learning through the establishment of nationwide, tech-rich study centres. It also intends to include overseas students in its future plans. It is located in Cyberjaya, within Malaysia's Multimedia Super Corridor. It offers both sub-degree and degree programmes in business and ITC-related programmes.

Students spend the first two semesters at their study centre in part to be familiarised with the Intranet system. After this period, physical attendance is not a requirement as they can access the Intranet from home. A virtual library is to be established to provide support at either the centres or at home. Students are expected to participate in both academic and non-academic virtual communities.

Three hundred students started their foundation year in September 1998 with current plans for 41,000 students to be registered through 12 study centres. Eligibility to study is currently determined by strict academic requirements. Courseware is to be distributed on CD-ROM and then updated through the Internet. Online classes will be held with shared whiteboards and streamed audio through the institution's Intranet. Student study teams will facilitate learning through a variety of virtual environments. Web site: *www.unitar.edu.my*.

Singapore

- *Singapore ONE* is a central resource for Singapore's co-ordinated approach to incorporating new communication technologies into education. ONE is a nationwide broadband network that will deliver a new level of interactive, multimedia applications and services to everyone in Singapore. Resources for all ages involved in education are provided through its service. Sites involved are from government educational institutions and private companies offering education courses. It appears that Singapore is keen to allow market forces to determine the extent of Internet-based teaching.

  A number of institutions offer their online offerings through ONE. Potential practitioners of Internet education will find it useful to view these sites, as generally they make use of the high end of the technology due to the availability of large bandwidth through the ONE system. Examples of these institutions are given below:

  Web site: *www.s-one.gov.sg*

- *Virtual College* was launched in 1997 and is run by Singapore Polytechnic to offer online courses. Thirty-seven modules are currently offered in Engineering, Information Technology, and Business with a further 24 planned for the end of 1998. Students are able to study the courses at their own pace with the assistance of a tutor, although the vast majority of students are full-time and access the courses on campus.

  Recently Singapore Polytechnic has entered an agreement with SingTel for the use of its Magix service to deliver its courses to the homes of students through the Singapore ONE high-capacity network platform. This enables access through a networked home computer at 5.5 megabytes per second through a phone line!

  Web sites: *www.sp.ac.sg/department/vc/modules.htm* and *http://164.78.252.19/s1start.html*

- *Informatics1* provides students from Singapore and Hong Kong with access to programmes from a number of educational institutions in the United Kingdom. Study is self-paced through virtual classrooms. It provides a good example of the type of educational invasion occurring through the Internet.

  Web site: *www.informatics1.edu.sg*

- *Intra-tech Education* specialises in providing education to children. Primarily the site contains Javascripts teaching users how to correctly form Chinese characters as well as speak Mandarin.

  Web site: *http://203.116.95.67*

- *Sky Media* offers "Skytutor," revision sites for O-level Physics and Chemistry using sound and synchronised images

  http://203.116.81.7

Thailand

- *Sukhothai Thammathirat Open University (STOU)* is the biggest distance education provider in Thailand, but it does not appear to have any current courses offered through the Internet or any plans to do so.
- *The Asian Institute of Technology* is offering four courses using streaming video.

  Web site: *www.ait.ac.th*
- *SchoolNet* is a dedicated network for schools to use the Internet. It was piloted in 1995 and was expected to have 1,500 schools online by 1998. The main purpose is to encourage interaction between schools as well as enhancing Internet experience among children. Accompanying this project is Classroom 2000 (*http://ntl.nectec.or.th/classroom*) which provides a number of teaching resources over the Internet.

  Web site: *http://www.school.net.th*

Virtual Libraries

While institutions may be slow in developing teaching through the Internet, it appears that librarians in the region have accepted the challenge of using the Internet as a means of allowing students to access library resources. Two examples are described below, but it is not clear from either how the virtual library will form part of the integrated virtual institution. Given the problem of copyright for electronic versions of textbooks, it seems unlikely that the virtual library will provide students with the type and extent of access offered in face-to-face institutions. This challenge suggests that virtual libraries need to develop their identities as completely different types of resource centres.

Open University of Hong Kong

Open University of Hong Kong is expected to be a prime example for the region of virtual access in libraries. The first phase of the project has been completed and students already have access to a wide collection of electronic databases, resources, and collections as well as different types of supplementary course material. To date there has been little integration of the use of this facility in course design or development except for research-based courses, which can direct students to access the associated resources.

The second phase plans to include electronic versions of course textbooks for students to access.

Web site: *www.lib.ouhk.edu.hk*

Tsinghua University, China

Tsinghua University is in its early stages and it is simply an attempt to provide students with a directory of resources available on the Internet together with access to CD-ROM databases.

Web site: *www.lib.tsinghua.edu.cn/english*

Appendix 9.1

The Development of Virtual Institutions in Korea

Insung Jung (Korea National Open University)

The Context

The Ministry of Education in Korea has set up a six-year (1997–2002) strategic plan for establishing infrastructure and encouraging the use of information and communication technology (ICT) in education. Under this plan, several projects have been initiated with government funds. These include equipping all classrooms in schools with a multimedia network system, providing two computer labs for each school and a computer for each teacher, computerising students' profiles and records, developing educational software and a database, and implementing virtual education. To meet the goal of the last item, implementing virtual education in primary and secondary schools, the Korea Multimedia Education Center was established in April 1997.

To explore ways of integrating a network-based virtual education system into the existing higher education system and identifying appropriate legislative policies, the Ministry of Education initiated the virtual university trial project early in 1998. This trial project led to more than 40% of higher education institutions in Korea offering distance education courses using the Internet, CD-ROM, CATV, or video-conferencing systems by the fall of 1998. The courses offered from about half of the institutions were designed primarily for undergraduate students. Adults and professionals were targeted by less than a quarter of the institutions.

It has been noted that for K-12 schools, integrating multimedia materials into the conventional classes and increasing two-way interactions are important goals for virtual education programmes, whereas for the higher education institutions, increasing student access and making courses available at convenient locations and time are rated as very important.

The dramatic progress in the field of ICT has influenced the method of training in the business sector. The development of advanced telecommunications has led to a paradigm shift in education and training in enterprises. Many virtual training courses have been created to allow employees to overcome the difficulties of geographical distance and limited training time and to receive "just-in-time" and "on-demand" courses in more flexible modes.

It is believed that, in the coming years, Korea will see tremendous growth in the number of schools, colleges, universities, and training institutions that offer virtual education and use information and communication technologies for their education and training.

Virtual Education in Primary and Secondary Schools

Distance learning in K-12 education received legislative backing in 1997 when the Ministry of Education enforced the law permitting distance education as a formal method of teaching and learning in schools.

Educational Broadcasting System

The Educational Broadcasting System (EBS) was set up in 1990 as the affiliated organisation of the Korean Education Development Institute (KEDI) to support school education by providing educational TV and FM radio programmes primarily to students in K-12. The government subsidises 50% of the budget for EBS.

The EBS programmes are on the air by TV for eight and a half hours every day and by FM radio for twenty hours a day. More than 50% of the programmes concern school curriculum, and K-12 schools are using them to supplement their classes and provide virtual learning experiences to the students. Foreign language conversation, vocational education, environmental education, culture, music, and art programmes are all used in the schools, and other general distance education programmes for children, youth, teachers, parents, and the public are also offered.

In 1997, EBS began to provide distance education programmes in a more systematic form via satellite for high school students. These programmes are used during class hours and also by the individual students at home. Recently, EBS began to operate the Internet TV station and provide these distance education programmes in a digitised format.

Web site (Korean language): *www.kedi.re.kr*

Korea Air and Correspondence High School

The Korea Air and Correspondence High School (KACHS) was founded in 1974 as the affiliated organisation of the Korean Education Development Institute (KEDI). It aims to provide opportunities for high school education through distance teaching methods to those who, for various reasons, could not receive or continue their high school education. KACHS mainly operates a method of distance education using EBS TV and radio, printed materials, and face-to-face schooling by teachers in conventional high schools.

As the computer network became available to its students, KACHS adopted the PC network and Internet as supplementary media to deliver some of its courses such as English, Mathematics, and Sciences.

Web site (Korean language): *www.kedi.re.kr*

Distance education project at primary schools

In 1995, the Ministry of Education and the Ministry of Information and Communication funded a distance education project that used a two-way video-conferencing system with a T1 communication line. The video-conferencing system connected one large primary school and four small schools in a mountainous province. Using the video-conferencing system, the students in the four small schools where qualified teachers in specific subjects were not available could receive the lessons provided by the teachers in the large school.

Korea Multimedia Education Center and Internet Model School Project

The Korea Multimedia Education Center was established in 1997 to provide a full service Web site called EduNet. The EduNet is an integrated Web service that distributes educational Web materials and services to students, teachers, educational administrators, and parents. It is also designed to provide virtual learning programmes through a computer network. For students, the EduNet provides learning materials, self-study packages, self-evaluation tools, and other counselling services. For teachers, the EduNet provides teaching materials, articles, legislative information, and virtual in-service teacher training programmes. For parents, the EduNet provides information about their children, counselling services, and parents' education programmes.

The Korea Multimedia Education Center initiated the Internet Model School project, which emphasised use of the EduNet services for teaching and learning in K-12 schools. The Internet Model Schools are encouraged to use Web materials for their teaching and learning and promoting two-way interactions between teachers and learners or among learners. In 1998, more than 80 schools were involved in distance learning projects using the Internet and the EduNet services.

Web site (Korean language): *http://edunet.kmec.net*

Virtual Education in Colleges and Universities

Korea National Open University

The Korea National Open University (KNOU) was founded in 1972 as the only distance teaching university in Korea. KNOU has maintained the mission of serving the advanced educational needs of adults and awarding degrees at the bachelor's level. The official purpose of KNOU is to raise the people's overall educational level by providing opportunities for higher education to those high school graduates who, for various reasons, could not receive or continue their university education; to improve the academic and professional proficiency of people who are already engaged in professions; and to make major contributions to the welfare of the nation and to society as a whole.

KNOU offers 18 major areas of study. Teaching and learning is conducted through the various media of cable TV, radio, audio and video cassettes, video-conferencing, Internet and other computer network, and face-to-face schooling and tutoring.

Since 1992, KNOU has provided database services to its students through a nationwide computer network system. Using the database services, the students can obtain supplementary learning materials for each course, updated news of their department, and information in *KNOU Weekly News*. KNOU has also developed CD-ROM titles and Internet courseware for some degree subjects.

In 1995, with funds from the Ministry of Information and Communication, KNOU launched a project to research the use of the Internet. As a result, an interactive video-conferencing network was introduced for educational programmes in the geographically scattered regional and local study centres. Using this network, the project connected 14 centres; introduced interactive tutorial sessions; held various meetings among university members in different places; encouraged open discussions among students, faculty members, and general citizens; and created non-degree programmes such as teacher training. This video-conferencing system uses a commercial T1 line for transmission.

In February 1998, KNOU decided to participate in the Virtual University Trial Project initiated by the Ministry of Education and joined a consortium, the Korea Virtual University Consortium (KVU), consisting of eight conventional universities and KNOU. The members collaborate in designing Web-based virtual courses and in delivering those courses to their students who wish to study at a distance.

The KVU consortium provided 41 Web-based virtual courses in the spring of 1998 and 39 more in the fall. To ensure the courses were of the highest quality, a virtual administration office and quality assurance system was established. In 1999, the KVU consortium will develop several lifelong, non-degree virtual education programmes for adults who are not the students of the member universities.

Web site: *www.knou.ac.kr*

Korea Polytechnic University

Korea Polytechnic University was founded in December 1997 with funds from the Ministry of Industry and Energy. Its purpose is to train technologists working in the practical fields and to provide continuing education for craftsmen

and technicians through distance education along with field-experience and face-to-face education.

The university has established the Center for Distance Technology Education and Training to develop various models for distance technology education and to develop virtual courses in the fields of technology education.

In 1999, the Korea Polytechnic University will establish several regional study centres and a network system linking the headquarters to the centres.

Virtual University Trial Project

In February 1998, eight conventional universities and seven consortia of universities and private companies joined together to take part in the Virtual University Trial Project initiated by the Korean government. This project aims to explore ways of setting up a high-quality, cost-effective virtual education system, develop and implement distance education courses, identify appropriate policies and standards for running a virtual university, and share experiences during the trial period. The project will last until February 2000, and during this period, the Ministry of Education will enforce the revised higher education law, accepting a private virtual university as a formal higher education system. It is expected that after 2000, Korea will have several private distance teaching or virtual universities that will adopt ICT in delivering their courses.

The universities and the consortia participating in the virtual university trial project, and their URLs, are as follows:

1. Conventional universities

- Yeungjin Community College: Provides practical courses to the community (*www.yeungjin-c.ac.kr*).
- Dongguk University: Has established an interdisciplinary virtual programme under the name School of Cyber Creation (*http://cyber.dongguk.ac.kr*).
- Sogang University: *http://multinet.sogang.ac.kr.*
- Gyungsang University: *http://vu.gsnu.ac.kr* (Korean language).
- Chnungnam National University: *http://business.chungnam.ac.kr.*
- Hankuk University of Foreign Studies: Provides foreign language courses using the Internet and synchronous technologies (*www.hufs.ac.kr/cyber*).
- Sookmyung Women's University: Provides retraining courses for professionals such as pharmacists and TESOL experts (*http://snow.sookmyung.ac.kr*).
- Seoul National University: Provides Internet courses for students and lifelong learning programmes for the public (*http://snuvc.snu.ac.kr* – Korean language).

2. Consortia

- Korea Peninsular Virtual Campus: Five conventional universities providing virtual ICT programmes for adults (*www.inje.ac.kr*—Korean language).
- Korea Virtual University Consortium: Provides virtual courses for students of its nine member universities and for other adults (*www.knou.ac.kr*).
- Korea Online Virtual University: Provides practical courses for adults registered in the lifelong education centres of four member universities.
- Korea Universities Virtual Education Consortium: 22 universities and a newspaper company's consortium provide virtual courses using satellite and the Internet (*www.chosun.com/class*—Korean language).
- Bool Virtual University: Four member universities providing graduate degree programmes for teachers and public officers (*http://bool.tit.ac.kr*—Korean language).

- Open Cyber University: 12 universities, a newspaper company, and an SI company, Samsung Data System; provide Internet courses for students of member universities and lifelong programmes for the public (*www.ocu.ac.kr*—Korean language).
- Seoul Cyber Design University: Two universities specialising in Art Design providing virtual courses (*http://cyber.hongik.ac.kr*—Korean language).

Open Cyber University (OCU)

Open Cyber University (OCU) university is considered an excellent example of the future virtual institution, with an efficient organising body. It was officially founded in October 1997 and started its educational services in September 1998. Twelve conventional universities, a newspaper company, and Samsung Data System collaborate in managing and funding this university. The member conventional universities provide content and design virtual courses, while the companies provide advanced technologies and technical skills needed to deliver the virtual courses and advertise the university.

OCU offers degree programmes for the students from the member universities and non-degree and certificate programmes for other people. Based on a well-established course management system, OCU develops virtual courses that reflect learners' needs. Web-based instruction, real-time interactive education, non-symmetrical satellite-based education, and off-line CD-ROM-based instruction are common uses of educational technologies. In the first quarter, OCU had 914 students from the member universities and 122 adults from outside enrolled in its virtual courses.

Sookmyung Cyber Education Center

The Cyber Education Center of Sookmyung Women's University, established in May 1998, is now offering virtual programmes for professionals. The primary functions of the Center include disseminating electronic information, establishing databases for professionals, providing a digital cyber library, and designing and developing virtual courses.

In 1998, the Center offered virtual programmes for pharmacists, general Engligh experts, TESOL experts, and music therapists. In 1999, the Center will offer virtual programmes for child education experts, nutrition counsellors, and virtual education specialists. After the trial project ends, the Sookmyung Cyber Campus will be founded based on the work of this Center.

Seoul National University Virtual Campus

The Seoul National University (SNU) is Korea's most respected traditional university. It provides distance education non-degree programmes to engineers who are working in companies using interactive video-conferencing.

In addition, SNU has created a virtual campus that provides several Web-based credit courses for its own students and those from other universities. Non-credit courses are also available at the SNU virtual campus. Its virtual courses use the Web as a primary medium and face-to-face tutoring by a course facilitator as a supplementary method of teaching.

Virtual Teacher Training

As computer networks became popular in the early 1990s, teacher training institutions began using them, and eventually the Internet, as a teaching and communication tool along with conventional training courses. However, distance or virtual training courses for teachers were not credited by the Provincial Office of Education until the Korea National Open University (KNOU) provided a distance teacher training programme in 1997. KNOU, with the support from the Ministry of Education, created a distance training

programme for primary school teachers using CATV and a two-way video-conferencing system in 1997. By the winter of 1998, the programme had been delivered four times and each time, 1,600 teachers took this virtual training course at home.

In the summer of 1997, the Ministry of Education and the Ministry of Information and Communication funded a project to create a Cyber Teacher Training Center within the Korea Multimedia Education Center. A software platform for managing the virtual teacher training and 11 training courses were developed as a result of the project. With the additional six courses developed in 1998, these virtual teacher-training courses are now available through the EduNet, which is an integrated educational service on the Web.

Virtual Training in Enterprises

ICT- based virtual training in Korean enterprises began in 1996. The Human Resources Development Center (HRDC) in Samsung Group formed a distance education team and began to provide virtual courses to their members. After establishing the HRDC Web server in 1994, the Center started developing virtual courses. In 1996, Business, English, and Marketing courses were offered, and in 1997, 10 more courses and several Web video lectures were added. In 1998, Samsung Cyber Campus (*http://cyber.samsung.net*) was launched to provide virtual training courses in a more integrated form, and a total of 28 courses were offered. There will be 10 more courses offered in 1999.

Among the 28 courses, 13 are in the area of basic job-related skill acquisition, 8 in advanced job-related skill acquisition, 6 in management, and there is 1 Samsung induction programme for foreigners.

These Web-based virtual training courses are planned, designed, managed, and evaluated by the distance education team within the HRDC. Actual production of the courses is done by outside companies. In the process of planning and designing, the Samsung Network-ISD model is used. To manage the Samsung Cybercampus, the Distance Learning Support System has been used.

Other enterprises have also made efforts in virtual training. The Korea Banking Association has set up a Cyber Banking School to provide virtual training courses for its member institutions. The LG group has also established a Cyber Academy to provide Web-based virtual courses to its employees. The Korea Telecom and the Posco Company have used the Web and desktop video-conferencing system to deliver training courses.

As the economic crisis continues to affect enterprises in Korea, it is expected that more companies will adopt the method of distance education for their training to reduce the training costs in the long run.

Conclusion

Due to the exponential growth in ICT, many new forms of educational media have been made available over the years, with the support of the Korean government. One of the most attractive traits of these new virtual education media is that they eliminate the spatial limitations and time constraints of education. In other words, a person's need to be actually present at the instructional site at a designated time is eliminated. This has made education and training more affordable, flexible, and effective.

The evaluation report written by the Korea Multimedia Education Center in 1998 indicated that the educational use of ICT projects in K-12 schools showed positive results in spite of a short implementation period. These results were attributed to the government's strong will and financial support, school principals' leadership, and teachers' dedication. The problems identified in the evaluation report included teachers' lack of relevant skills to use ICT effectively, insufficient information infrastructure in schools, and difficulties in technology maintenance.

Virtual education projects in colleges and universities have not yet been systematically evaluated. However, several reports presented by individual researchers showed that virtual courses proved to be a more flexible form of education, thus gaining more satisfactory responses from the learners. Increasingly, higher education institutions are announcing the introduction of virtual degree courses for their students, non-degree lifelong education courses for adults, and specific skill training courses for professionals.

Virtual training programmes for professionals are expected to grow drastically. The Korea Multimedia Education Center and other teacher training institutions have already announced their plan to develop Web-based virtual courses for teachers in the next year. Many human resource divisions in private enterprises, suffering huge cutbacks in their budgets and numbers of workers, have decided to incorporate distance education using the advanced technologies into their training system.

Despite the positive feedback for the virtual learning experiences, there are several points worth mentioning when considering the future of virtual education. First, it would help to establish a nationwide educational computer network system backed up by the Internet so that multimedia materials could be properly used in classrooms and at homes and so students and schools in remote areas would not be excluded by technical limitations. Second, various educational entities, both public and private, should be allowed to develop instructional materials, virtual education and training courses, and electronic libraries so that learners have more opportunities to choose appropriate courses for their educational needs. Third, continuous training opportunities must be offered to teachers, instructors, administrators, trainers, and professors. And finally, it's crucial to establish quality management and accreditation system for virtual education.

10 Virtual Education Institutions in Australia: Between the Idea and the Reality

MRS. SUELLEN TAPSALL & DR. YONI RYAN

Introduction

Australia's pre-eminence in the area of distance education has been widely acknowledged. Given our geographically dispersed population, large distances, relatively sophisticated technological infrastructure, and long experience in off-campus delivery, it might seem axiomatic that Australia would be a pioneer in using information and communication technologies (ICT) for teaching and learning across the range of sectors.

Further, Australia is the third largest national provider of training and education in English to international students after the U.S. and the U.K., with nearly 20,000 students in "twinned' campuses" offshore, and a further 6,000 enrolled by distance (*Campus Review*, "International Review," November 1998, p.7). This might also suggest a relatively high use of distance methods and technologies. That ICT has not been heavily utilised for overseas delivery has as much to do with a decision to spread the industry dollar into the Australian community through "import education" as it has with the recognition of the low opinion of distance education in Asia, Australia's major market.

Indeed, Australian educators *have* been early adopters of ICT, from the establishment of Schools of the Air, based on radio, for isolated primary school students in the 1930s. Multimedia technologies have been incorporated into many individual courses and have been used for administrative purposes in many dual-mode or multi-campus tertiary institutions offering both on- and off-campus programmes. But on the other hand, Australia has not yet established a virtual university; it has still to realise recent plans for a virtual TAFE College (Technical and Further Education College) in one state, Victoria; and there is no evidence of any virtual primary or secondary school activity. There is talk of much activity in the corporate sector (e.g., Qantas College Online), but such terms at present connote more about management efforts to promote the notion of a learning organisation than any real structure. In all cases, the major use of ITC has been in simplifying and automating administrative processes such as enrolment, student-status inquiries, and communication and management decision-making across campuses.

There is an acute understanding throughout all sectors of the pressures regarding new learning technologies, and a recognition that wide uptake of ICT for teaching and learning purposes is a function of economic and ideological imperatives at the external level and pedagogic imperatives at the internal level. On the one hand, advances in technology use are occurring in a time of decreasing public outlays on education at all

levels, from 6% of GDP in 1977–78 to less than 5% in 1998 (*Campus Review*, November 11–17, 1998, p. 8). On the other hand, the agenda of the federal government department responsible for funding higher education is clearly to promote the new technologies.

Defining the Beast

One of the difficulties associated with such an investigation is the confusion of terminology that has developed at almost the same pace as the technology. It is not uncommon for terms such as virtual and online to be used interchangeably by individuals to describe different approaches to technology integration. In our book *New Media and Borderless Education* (see References), we described the virtual university as primarily having two forms: one existing independent of a physical location (although, like Open University in the U.K., it might otherwise resemble a traditional university), the second denoting an online institution with some or all parts of the virtual campus replicated using information technology. We later expanded that definition of virtual institutions to include organisations that broker educational services; these may take the "shopping trolley approach" to education and training, providing a basket of goods and services drawn from partner institutions.

The brokering agency has a very recent history in Australian education. Thus far, only the Open Learning Agency of Australia (OLA) has established itself with any credibility. We define a broker as an entity that does not of itself develop curriculum or employ teaching or support staff, but rather assembles programmes with materials developed by educational providers, offers these to students in combination with other subjects to develop a full programme of study, and contracts with one or more of the providers to actually confer the qualification on successful completion of the individual units.

When OLA Australia was originally established in 1993, its function was purely brokerage. It was intended as the only open institution in the country without entry qualifications and was a response to unmet demand resulting from quotas for university education. Since then there has been a large expansion in the university intake, and OLA's costs and unwieldy arrangements with its provider universities have caused enrolments to plummet. Hence it has planned to begin commissioning its own subjects and courses, and holds high hopes for an online M.B.A. for the overseas market. However, its future is uncertain. There is apparently limited interest in this sort of operation, and would-be students at present seem to prefer the "brand names" of established educational institutions. OLA has also been troubled in 1998 by resignations and retrenchments of key staff and revelations of deep divisions both within the agency and a relationship akin to "enmity" with partner universities (*The Australian HES*, July 1, 1998, p. 36).

In Australia, "flexible delivery" has increasingly been used to describe content delivered in non-traditional face-to-face mode. Flexibly delivered units may be offered using multiple media, including CD-ROM, Internet, video-conferencing, tele-conferencing, and audio-conferencing. Students may take these units on-campus or from a distance. Australian universities, pushed to incorporate technology on a yet-to-be-confirmed basis that it is a solution to some sectoral problems (e.g., costs, increasing demand for access to education, shrinking public budgets), fit along a continuum with some moving faster and closer to a totally online presence. Many could be considered dual providers—those traditional institutions that are offering both traditional face-to-face programmes with a "bricks and mortar" base and also as providing virtual educational experiences.

Various institutions, including University of Queensland and Griffith University, have announced the opening of online campuses. Rather

than being totally online alternatives to face-to-face teaching, these tend to be physical campuses that take the institution into new geographic markets. Griffith University's Logan campus, for example, is heralded as an innovation in flexible delivery. It has just one large formal lecture theatre, although the use of this for large classes has been discouraged. The majority of communal spaces are technology-enhanced learning centres and small group spaces. Some lectures are provided from other campuses via video-conference and tele-conference facilities, however in a number of disciplines these tend to be interactive question-and-answer forums between content experts and students. The development of this campus has seen an increase in some disciplines in problem-based learning and small group tutorial approaches to curriculum.

Finally, no serious examination of new technology use in education in the late 1990s could be complete without some mention of the advent of, and growth in, the "corporate university." These institutions are largely possible because of the combination of technological convergence and globalisation in the commercial sector, which has necessitated the use of technologies in training worldwide employees.

The Emergence of the Beast

J. Taylor, in *Perspectives on the Educational Uses of Technology*, analyses the historical progression of distance education models by building on Soren Nipper's three generations model, in a four part schema:

1. The correspondence model (print based)
2. The multi-modal model (highly developed structured resources including videotapes, audiotapes, and computer-assisted learning)
3. The tele-learning model (interactive telecommunications, instructional use of audiographics, and two-way tele- and video-conferencing)
4. The flexible learning model (CD-ROM, Internet)

These appear to align with a broader socio-historical emergence of concerns in distance education. That is, distance education emerged in response to the issues of distance (geographical distance from a major learning centre when education was conceived primarily as a face-to-face model) and disadvantage (lack of preparation for tertiary studies or domestic responsibilities, preventing admission by the usual means). Open learning models, while also providing answers to problems of distance, primarily focused on issues relating to lack of entry qualifications and "second-chance" entry, moving to meet the needs of the disadvantaged cohort, through a range of alternate learning styles and subjects.

The preoccupation with flexible delivery in the late 1990s in countries like Australia is less about distance or disadvantage, and more about meeting the needs of the worker-student, providing "more" educational opportunities to "more" students at "less" cost. Australian institutions see technologies such as the Internet and CD-ROM as providing delivery of learning environments to any student, anywhere, at any time—whether an internal or external student. Flexible delivery modes are being used as much as a solution to on-campus problems as to off-campus access. Consequently, face-to-face, distance, and open learning modes of delivery are converging and the boundaries between these modes are blurring.

It may be that there is a correlation between these three educational models and Taylor's four stages of distance education that could provide insights into appropriate technological solutions for socio-educational problems. If dealing with issues primarily of distance, it may be that traditional "correspondence" methods are a viable

solution. If open access and disadvantage are an issue, the multi-modal and tele-learning models present solutions. Where the distinctions between these models are disappearing, converged delivery styles (the flexible learning model) become a more viable alternative. Table 10.1 outlines these relationships graphically.

Towards "Virtuality"

It is difficult if not impossible to disaggregate the uses to which ICT has been applied in Australia. Many systems have been deliberately developed or are in the process of development as total systems, incorporating an online information face with enrolment and administrative systems, course details, some learning resources, assessment systems, and online communications with both academic and administrative staff. However, we attempt here to give examples of the more interesting uses in each area specified.

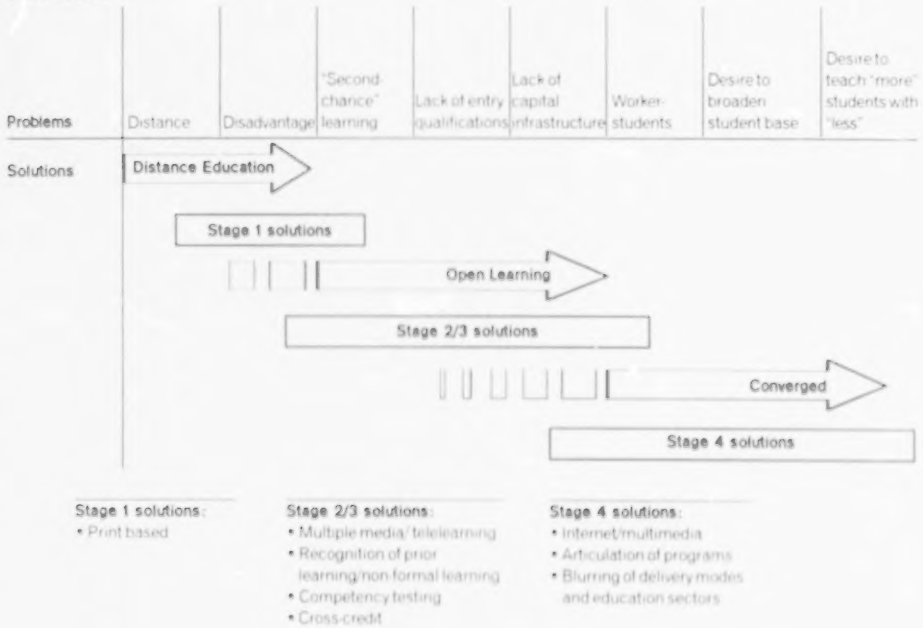
Administration

University sector

All universities in Australia now utilise sophisticated electronic networking systems for administrative purposes such as enrolment, student records, student administration, staff records, and fee payments. The costs and delays in introducing robust networking systems have cost some universities dearly. For example, the collapse of the contract between a consortium of universities and a systems supplier, Casmac, in 1997 lost the institutions concerned some $100 million, and has resulted in costly continuing litigation (*Campus Review*, March 12–18,1997, p. 7).

Table 10.1

The relationship between educational models and the stages of distance education



Over the last five years, all tertiary institutions have developed a Web presence for marketing and prospective student purposes. Video-conferencing and tele-conferencing is common, particularly in those institutions designated in the 1980s as distance education centres. Inter-campus communication has been facilitated by such telecommunications and was initially funded through special grants to the centres to encourage the use of new technologies for teaching and learning. However, the technologies were mainly applied to administration, notwithstanding many pilot programmes using them for core educational activities. Leaders in these pilots were Monash University, UNE, Charles Sturt University, and Curtin University.

The primary use of ICT in Australian education at all levels is administrative. Whether because of ideological demands for accountability or because the technology exists to collect more comprehensive data, most institutions in the education sector have highly sophisticated administrative software systems and networks. In 1998, many of these were not completely integrated (e.g., admissions may not be networked with payroll), but increasingly software systems are moving to one platform, as in the planned Monash-SAP R/3 system, which will replace almost 80 different computer systems, the heritage of numerous amalgamations with other institutions.

In Australia, each state currently has a tertiary admissions centre that determines university and (generally) Technical and Further Education College selection following the state's final school year assessment. Almost all states currently operate interactive voice response telephone system inquiries for school leavers seeking admissions information, and by the end of 1999, all plan to have an active Web-based site for information and applications. In Victoria, one of the most-advanced states in terms of government-driven information technology policies and procedures, about 10% of 1998 tertiary applications were made via the Web (*The Australian HES*, October 28, 1998, p.37).

VET sector

State providers of vocational education and training (VET) have progressively networked their administrative functions to respond quickly to central directives and co-ordination, but the devolved management of colleges has prevented full utilisation of these networks. All states are moving towards a more co-ordinated and centralised networked online system for information and student administration (see the section, In the Making, below). In several states, learning centres have been established to encourage the use of multimedia, especially video-conferencing and the Internet. The Queensland Open Learning Network, for example, has an extensive network of centres that, in effect rent their equipment, via an annual levy, to participating institutions such as TAFEs and universities.

Schools sector

As one of the smallest states, and the most centrally governed, Victoria has emerged as the leader in the establishment of infrastructure for its schools sector. A $50 million project, VicOne, connects all public schools, the Education Department, the Board of Studies, and a range of government sites via a WAN. The project, among many others in the public and private sector, is overseen by a dedicated Minister for Multimedia.

Materials development production and distribution

To date, the most interesting aspect of learning material development in Australia is in the number of small private consultant firms that have been established to capitalise on the new technologies and their application to the education sectors. Some of these have been deliberately set up as part of a national government

scheme, the Cooperative Multimedia Centres (CMCs) to forge private-public partnerships in the area of emerging technologies. A local Queensland example is QANTM. QANTM General Manager Shawn Ket suggests this CMC is the most focused in Australia in the area of education and training, saying it has a "cradle-to-grave" training philosophy.

The centre is delivering K–12, vocational, and diploma training in multimedia and new technologies, in partnership with a range of universities, schools, VET organisations, and private providers. Supporting notes and student resource material are all electronic-based, both downloadable and accessible via the Web. The centre provides teaching into schools, as well as cyber camps and summer and winter schools for primary and secondary students.

The centre plans to officially launch its online Diploma in Multimedia, developed in consultation with Queensland TAFE, in February 1999, but it already has 70 students studying the self-paced, project-based modules. It is involved in a range of government-based training schemes and will launch a Diploma of Gaming, supported by corporate partners Auran (one of the country's leading computer games companies) and Boeing, in 1999.

The university sector

Although a number of attempts have been made at the national level to co-ordinate the production and dissemination of learning materials based on the new technologies, particularly those that are more expensive to produce such as CD-ROMs and Internet-based materials, the various relevant projects have been singularly unsuccessful at preventing the "reinvention of the wheel."

EdNA (Education Network Australia), for example, was established initially in 1994 to collect and distribute electronic resources developed by public funding in all education sectors. Unfortunately, the voluntary nature of the clearinghouse meant that it attracted few deposits, except from the primary sector, since universities almost invariably contributed their own funding to resource projects, and in a competitive regime, were loathe to lose any commercial sales through free distribution of materials. EdNA also suffered from a lack of exposure and limited funding.

In 1997, EdNA was reconstituted with a brief to co-ordinate and disseminate a database of all learning materials produced in the three education sectors as described on its Web site (*www.edna.edu.au/EdNA*):

> The site is organised around Australian curriculum, its tools are free to Australian educators, and it is funded by the bodies responsible for education provision in Australia—all Australian governments.
>
> It is a network in several senses. EdNA is a Web site pointing to thousands of resources identified and contributed by Australian educators. It networks the bodies responsible for Australian education. Discussions and noticeboards are offered on the site, making it a meta-network of Australian education practitioners. Its services create communities of educators online—further networks. EdNA covers the schools, vocational education and training, adult community education, and higher education sectors. Through the EdNA forums, the Australian education systems and sectors collaborate on a range of online education, communications and information technology issues—a powerful network.

EdNA continues however, to suffer from limited recognition in the sectors.

Each university has a for-profit, or more commonly a cost-recovery, centre charged with the development and production of learning materials utilising the new technologies. One example of the for-profit centres is METALE,

the Metaphoric Experiential Training and Learning Environment Unit of the Canberra Institute of Technology (*www.cit.act.edu.au/metale*) where "metaphoric" is "the replication of workplace experiences for learning purposes." METALE has worked closely with Qantas College Online, its largest client to date, to develop four workplace-related modules of learning materials.

University centres commonly undertake the development of a template for internal users. The University of Melbourne commercial arm has used a Department of Industry, Science and Technology grant for $174,000 to develop Creator, a template for those unfamiliar with HTML protocols to enable them to produce materials for online access. Many commercial operators compete in this area.

A bewildering number of consortia exist as partnerships between university and VET providers, both public and private, and often include software companies for particular projects in particular discipline areas. For example, OnFX is an Internet cum CD-ROM learning package for the production of course materials in Graphic Arts, which spans the university-VET sector, and has Apple and IBM as partners. The use of CD-ROM in this project was dictated by the large bandwidth required in graphics-based subjects, which limited the utilisation of the Internet in much of Australia.

Delivery and tuition

The university sector

Copyright restrictions have meant that although Australian university libraries make extensive use of the Internet for administrative purposes related to inter-library loans, electronic storage and transmission of resources is limited to those produced by lecturers for specific subjects, restricted in most cases to bona fide students of particular institutions.

Some outstanding standalone materials, mostly in CD-ROM form, have been produced within university multimedia centres, with a large number of award-winning items designed for the secondary and early tertiary market. The University of Wollongong's Interactive Multimedia Learning Laboratory has been outstanding in this regard. The materials are generally modules designed to be used within a larger subject or unit or as reference material. The Open Learning Agency of Australia initially depended heavily on broadcast TV to deliver its learning materials. However, most students reported videotaping the programmes for more convenient viewing. This, plus the costs involved, has led to a reduction in the television component of most programmes of study.

Few universities use the Internet alone for the delivery of learning materials and student support. Where it is used extensively, it is in a select group of subjects such as e-commerce or in open and distance learning courses. Curtin University of Technology in Western Australia, for example, has a Masters in e-commerce, using multiple media: the Internet, CD-ROM, tele-conferencing, and video (*www.cbs.curtin.edu.au/ecn*). It also offers a graduate certificate and a graduate diploma in Internet Studies, with all materials and classes conducted via the Internet, print-based materials provided where appropriate, and face-to-face meetings organised to suit students' needs. A new public university, Sunshine Coast, began its totally online M.B.A. in 1997 and now has 50 students. This currently appears to be the only wholly Internet-based M.B.A. in Australia.

Some Australian institutions have collaborated with media companies. Monash, which has had a long association with the Australian Broadcasting Commission (ABC) through its involvement in the Open Learning Agency, has forged an interesting alliance for a pilot not-for-credit subject, Money, Markets, and the Media. This was

developed by Monash academics and is delivered through complementary online real audio and text and shortwave and satellite radio transmitters (see *www.abc.net/money*). For Monash Vice Chancellor David Robinson, the venture is a partnership that allows the university and the ABC "to capitalise on global broadcast technology to deliver education throughout Australia and internationally." For the ABC's Managing Director Brian Johns, it is a glimpse of the ABC's digital future "where convergence means that our programming can be accessed by audiences on different mediums, and online," (*Campus Review*, September 23–29, 1998, p. 6)

In November 1998, the first full-page advertisement for a U.S.-based distance university programme appeared in the specialist education press, offering tuition via the Internet, video-conferencing, videotapes, satellite, and correspondence. (*Campus Review*, "International Education," November 11–17, 1998, p. 3). There was no indication whether the qualifications would be accepted in Australia, nor indeed whether Colorado State University Network for Learning (CSUN) was a private arm of this state university.

The VET sector

After some 15 years, the Australian National Training Authority (ANTA) has succeeded in securing all states' agreement for a national training framework and a national curriculum for some trade and semi-professional areas. Consequently, it has 18 packages of teaching and learning material developed in these areas. These have a strong emphasis on computer-based resources and online delivery, and they often incorporate video-conferencing for teaching purposes, especially in those vocations where employers prefer workplace delivery. The college network in Adelaide, South Australia, for example, uses video-conferencing extensively across campuses within the metropolitan area to avoid students having to travel for specialised subjects. In Queensland, an early use of video-conferencing for teaching was employed in the hospitality industry, where students are often situated in remote areas such as island resorts.

Many of these innovations in delivery using new technologies occurred because employers demanded less time off site for their trainees. It might also be noted that VET courses might be more amenable to multimedia delivery than university-level courses, especially if technical skills are involved.

Private providers

Qantas College Online is the Internet-based virtual college of one of Australia's air carriers. The corporation has various training arms, and Qantas College was the brand name of the corporate development and training area charged with identifying training needs across the corporation and focusing on interpersonal skills. It had no responsibility for cabin crew or operational training.

Qantas College Online was established to provide a framework and policy delivery mechanism and as a means to deliver training needs. The virtual training arm was set up after the corporation identified a need to provide training to the 30,000-odd corporate staff, who travel frequently and work a high proportion of shift work, which limited their ability to access face-to-face training. The corporation used to publish a schedule of face-to-face courses on offer at various locations around the world; this has now been replaced by online courses including business, management and customer service skills, and interpersonal communication. The virtual college offers accredited qualifications at certificate and diploma level in customer service, leadership, and management and has set up paths of articulation.

Much of the assessment is project-, competency-, or work place-based. It can be accessed at home, the work place, or in a number of learning centres set up in some of the corporation's larger operational areas throughout the

world. There are more than 40 different course modules, which take from 4 to over 20 hours to complete.

Qantas College traditionally operated on an outsource model, with external consultants delivering its in-house training. One result of the move to virtual delivery is that the college, in putting some of those programmes online, has purchased them and now owns them. It has also expanded its range of offerings and taken the opportunity to review its business programmes and develop new ones needed by their business and staff.

Other business training arms such as Optus, a telecommunications sales arm of the U.K. Cable and Wireless, prefer CD-ROM, audiographics, and face-to-face, although some components use Internet delivery.

"Off-the-shelf" solutions

Australian institutions tend to orchestrate their move towards virtualisation in one of two ways:

- By recreating the whole process for themselves, creating their own software programmes for administration, information, and communications.
- By taking advantage of "off-the-shelf" alternatives.

By the end of September 1998, at least eight universities had installed Callista, an Australian-developed student systems software programme. Both TopClass and WebCT (North American developed programmes for putting courses, class administration, student and staff communications, and teaching resources online) are in use in various universities.

At the same time, some universities have been developing their own products and making them more widely available. The previously mentioned Creator, a software programme that "allows anyone who can use a keyboard and a mouse to easily create courses online," was launched in August 1998. The product had already been sold to two universities and a corporate training company. It provides infrastructure for authoring of content online, content management, student assessment, bulletins, forums, chat sessions, problem-based learning, search facilities, and administration functions (including student records, enrolments, and database management).

Not surprisingly, myriad private providers of varying quality and credibility have emerged to capitalise on the perceived move to virtual education. These include operators who guarantee to move the traditional university to virtual campus in less than 60 days. Some examples are as follows:

- *Real Education*, the most-known proponent of this approach, has registered as a business in Australia and its supporters are known to have approached a number of Australian institutions.
- *DVP's* 32 CD-ROM CDX automotive training package was developed to service a world market, taking $5 million and three years to complete.
- *Armstrong Fleming* has established a "virtual education centre online" (including an "enterprise learning centre environment"), which can be customised to the client's satisfaction.
- *Redbean Pty Ltd* bills itself as "one of the pioneers of online education in Australasia." Redbean developed Big Tree OnLine to "facilitate the creation, management, and secure delivery of Web-based training and education programmes"(*www.bigtree.com.au*). Clients and partners include Apple Australia, Sunrise Research Laboratories (this partnership delivered an online education master class for Australian and New Zealand universities), and various K–12 schools.
- *CBTS Australia* distributes a range of computer-managed learning, curriculum, and assessment products (including Learning

Management System, The Learning Manager and TLM (Web) to Australia and Asia (*www.ola.edu.au/providers/virtcon/stubbs/poster.htm*). The largest user is Curtin University, with about 13,000 on- and off-campus students accessing approximately 40,000 computer-mediated assessments annually.

- *Eastern House* has developed a range of print-based resources and test banks used in conjunction with CBTS support systems; these resources are now used by more than 400 education providers and enterprises in Australia (via face-to-face classes, Intranet, and Internet).

Whole community approach

There are initiatives in Australia that represent a "whole life-whole community" approach to the integration of technology and virtualisation of government, administrative, health, education, and social interaction. Such an initiative is the seven-site Tanami Network, using high-speed digital narrow band video-conferencing technology via ISDN and satellite, which was established by four Aboriginal communities in remote areas of Australia.

The Tanami Network is about far more than education, although that is an important focus and was the initial reason for a three-year project that got underway in 1992. There is no access to comprehensive secondary education for Aborginal tribes in the Northern Territory, and the average school completion age is 12 to13 years for boys and 14 to 15 years for girls. J.M. Barker, in a paper presented in Perth in 1998, said "Many parents despair of making the impossible choice between a decent European education and dealing with the difficulty caused by children being absent in the very years they would be learning their position in the community and their roles in ceremony and cultural life." (See References.)

The Network started out with an emphasis on secondary and tertiary education in a trial of mixed-mode delivery, and a relationship was established with the Secondary Correspondence School in Darwin. Setting up links to tertiary providers was more difficult because of the limited number of remote sites. The project was driven *by* members of the local communities *for* members of the local community, and as a result has been used for a range of commercial, government, and social programmes. The Tanami model, which puts Aboriginal tribes in charge of their own communications and gives them the opportunity to communicate beyond tribal, geographic, and cultural boundaries, has been such a success that it is to be extended to communities in other remote parts of Australia.

Facing the Issues

There are many inhibiting factors and impediments to a wholesale move to an e-education system akin to the e-banking system, where limited face-to-face service has rapidly become the norm in Australia. We have explored these more fully in our book *New Media and Borderless Education* (see References); briefly, they are summarised as follows:

Practical issues

- *Bottom line:* Is there enough money in education for the media corporations?
- *Core business:* Will stakeholders and the management see education as a core business of the corporation?
- *Branding:* What is the place of brand names like Harvard? Can brand names like Disney, for example, compete against these "education names"?
- *Costs:* Electronic forms of education are expensive unless there is huge volume. No extensive financial model yet exists which takes into account all the factors involved. Cost factors are an issue for students, institutions, and government.

- *Differential regional take-up:* The take-up rate for Internet connection and telephony varies widely across the world.
- *Household take-up:* Notwithstanding optimistic forecasts about Internet connection in domestic residences, the figures continue to indicate that in Australia, most people access from work for work-related activities.
- *Industry volatility:* Both the technology itself and the booming nature of a new industry mean that instability is part of the scene.
- *Partnerships, alliances, and cultural clashes:* Educational institutions and business have had robust relationships in the past based on differing cultures.
- *Intellectual property and copyright:* No jurisdiction has yet grappled successfully with the claims of staff developing materials for Internet use through their institution or with the matter of electronic library access to all print-based materials.
- *Training teachers, support staff, and learners:* Huge programmes of staff development and learner development must be considered in any integration of online teaching and learning.

Pedagogical issues

- *Age-related factors:* Lifelong learning may be a reality for educational mangers and teachers, but it is far from being an accepted rubric in the community at large, especially in relation to learning via technology, where older employees may not have the skills or disposition to learn in this mode.
- *Local support:* UKOU has relied on local tutor support, and this is crucial in electronic delivery.
- *Education versus training:* There may be a limit to the sorts of activities that can be successfully learned online only.
- *Competency-based education:* This remains an issue at universities, where competency has been a hotly contested concept.
- *Cultural differences in learning styles:* There is insufficient acknowledgement in the literature of the learning preferences of different cultural and ethnic groups.
- *Technology and learning:* There is insufficient research to indicate whether students learn better with technology.

Policy issues

- *Accreditation:* This is the single most pressing issue for many institutions that are considering sharing courses to minimise costs, or to students who wish to enrol in organisations outside their state jurisdictions.
- *Levels of government support:* Who pays for cross-border enrolments?
- *Consumer protection:* Who verifies the new providers?

Philosophical issues

- *Access and equity:* Notwithstanding the lower prices for telephony services and computer equipment, regional differences and distance mean that equity remains an issue, even within developed countries.
- *Cultural imperialism:* There have been major concerns expressed about the imposition of U.S.-centric values via educational material.

Personal issues

- *Teaching and learning from a box:* This concept had a poor reputation in the 1950s. Radio and TV were also hailed as the education system of the future in their time; sceptics argue that the Internet may be another variant on that theme.

The Australian Perspective

The issues, we believe, remain the same today, despite debate that now accepts the Internet and virtual institutions as the way of the future. Here, we update several of these issues in the Australian context.

Staff development

Across all education sectors, staff familiarity and use of newer technologies remains a limiting factor in the uptake of electronic media. For example, a recent study in Australian universities ("Academics Online," reported in *The Australian HES*, October 28, 1998, p. 39) indicated that a lack of training was responsible for limited use of digital technologies for teaching and research. One-quarter of academics never used e-mail to communicate with students, and a large proportion used it no more than once a week to communicate with someone other than a friend on their own campus, the study found. More positively, 58% of academics at isolated rural campuses used the Web daily, compared with 42% of metropolitan institutions. Over 40% did not subscribe to any electronic newsgroups. Staff remained sceptical of the usefulness of the Internet for direct teaching and learning purposes: "The Internet as a teaching tool is far from useful at the moment. This is because access is slow, content of material available is, on average, very poor…Apart from e-mail and access to library catalogues, the Internet is a huge and costly waste of time" (*Campus Review*, October 28–November 3,1998, pp.1–2). (This report also called for research into whether the infrastructure and maintenance costs were justified in view of the educational returns, based on these figures.)

The relative poverty of TAFE institutions suggest that usage is even lower in that sector. Despite the drives of state education departments to supply infrastructure in the form of modems and computers in all public schools, the staff development needs of the secondary and primary sectors are enormous, according to union and departmental sources. With the exception of Bond University, most "for-profit" post-school providers in Australia have no policies on staff development for their casual teachers, nor do they pretend to be "technology-savvy." Indeed, they make a virtue of intensive face-to-face teaching.

Support crisis

Uptake of Internet-based or flexible-delivery teaching options, while not leading directly to the totally virtual campus, has been significant in some parts of the education sector, creating its own staff development problems. R. Atkinson, in a paper to the Ascilite Conference, December 1997, argues that the support crisis identified by an Australian Vice Chancellors' Committee (AVCC) paper in 1996, continues to be a problem:

> Teaching staff need support services such as media specialists, instructional systems developers, computing consultants and equipment technicians to assist them in gaining access to and effectively using IT. A phenomenon confronting many universities, however, is an insatiable demand for information technology services which appears to be growing day by day…The result is that many universities report that there is a "siege" environment in their IT support organisations…Many universities report an IT support crisis.

Infrastructure and technical difficulties

Unlike most European and North American institutions, many Australian universities are large federations of institutions separated by large distances. Charles Sturt University (CSU), for example, is spread over 500 kilometres in New South Wales, with five campuses and an external enrolment of 72%.

Telecommunications constitute an increasingly large component of the running costs of universities, despite the moves to shift these costs to students. Administrative costs cannot be shifted however, and the result is that a number of institutions have been obliged to provide their own infrastructure to avoid commercial providers' STD charging rates. The costs of "bricks and mortar" are rapidly being overtaken by fibre and microwave costs, which, perhaps unfortunately for politicians, are invisible.

Charles Sturt University has committed an initial $3 to $4 million for a 34 megabit microwave link for Internet access and voice and videoconferencing, although this is only expected to meet the university's bandwidth needs for the next five years. CSU's information technology executive director reported that the investment was not desired but necessary, because leasing adequate bandwidth from Telstra was too expensive. In late June, CSU joined a delegation of other regional Australian universities in proposing that the federal government fund a $20 million inter-varsity microwave network so they could compete with city institutions to provide distance education. Regional universities were reportedly desperate to increase access to affordable technological infrastructure.

The Australian Vice Chancellors' Committee (AVCC) was prescient enough to establish a robust Australian Internet (Australian Academic and Research Network, AARNet) for universities and the premiere research entity, the Commonwealth Scientific and Industrial Research Organisation, (CSIRO) in 1990. It has since committed large amounts of money to extend and maintain this system, $16 million of the total operating budget of the AVCC (*Campus Review*, November 11–17 1998, p. 2). Conscious of the need to divest itself of a "non-core business," in 1995 the AVCC handed management of the backbone to Telstra and in 1997, to a rival company, Optus. As an indicator of the centrality of the university sector in the growth of the Internet in Australia, it should be noted that AARNet still constitutes 40% of Australia's Internet traffic.

Upgrading of equipment and standards is a major issue for the public sector, with most state departments choosing to purchase rather than lease, with inevitable redundancy problems.

Technological Literacy and Demand for Online Learning

The abilities of students to benefit from any move to virtual education have as yet received limited attention outside controlled classroom situations. Our own research has shown that when TAFE or university students are asked their preference, they rarely ask for less face-to-face teaching. The evidence comes from qualitative data like the Baron, Thiele, and Hintz (1995) South Australian TAFE study of a new flexible delivery campus at Tea Tree Gully. One student wailed "I came here to learn and you aren't teaching me anything!" because the delivery method was resource-based learning supplemented with optional access to learning skills advisers.

The evidence also comes from quantitative data such as the recent Australian National Training Authority (ANTA) study by Warner, Christie, and Choy (1998), which reports that 86% of students preferred face-to-face modes of instruction. This study found that over 70% of students had average or below average levels of readiness for self-directed learning. All of their students were second-year TAFE students, and 67% were under 25 years of age. The authors observe that TAFE students are highly teacher-oriented, relying on teachers for motivation and direction. The extent to which we can expect students of any age to have the independent learning skills required with new technologies has not been fully explored.

An Australia-wide evaluation of information technology projects showed that university

students, too, while enthusiastic about the use of ICT in education, still preferred face-to-face teaching and learning, although it was not always possible (*UTS Anchor*, September 14–17 1998, p. 1). The federal government-funded study, *An Evaluation of Information Technology Projects for University Learning*, highlighted the dilemma for those contemplating greater integration of ICT into education programmes. The two-year study reviewed more than 100 projects undertaken at Australian universities, finding that massive expenditure on ICT alone was not enough to ensure learning. Report author Shirley Alexander concluded learning design is the over-riding factor in successful integration of information technology. "Spending a lot of money on a flashy Web site and complex content is not enough…Some educators rushed to put lesson material on the Web, but that was only one percent of what was needed." (*UTS Anchor*, September 14–17 1998, p.1)

Despite the push for Australian education and training to "go virtual," considerable questions are still raised about the demand and market for online courses and virtually delivered teaching. An Australian Bureau of Statistics household survey in February 1998 showed there were three million adult users of the Internet in Australia at that time (*Online-Ed*, September 13 ,1998). Of these, about one million used the Internet to find information relating to their studies, but this was the *least* reported type of Internet activity by adult users.

B. Pattinson and J. Di Gregorio found that roughly 80% of studying adult Australians accessed the Internet as part of that study. The majority of Internet education users were young (43% aged 18 to 24 years; 37% aged 25 to 39 years), adult Internet education users were largely city-based (79% living in capital cities) and most were employed (full-time 48%; part-time 22%). The authors concluded that while it was clear the Internet was an integral part of the education system for adult Australians, it was not clear whether they were using the Internet as a substitute for face-to-face classes, or simply as just another source of information for assignments. (See their article at *www.edfac.unimelb.edu.au/online-ed*.)

Government policy

We address the issue of government policy in *New Media and Borderless Education*, but in the time since the release of that report, the federal government's enthusiasm for online education has apparently grown. The final report of the West Committee, which reviewed Australian higher education in 1997–98, had a heavy emphasis on technological solutions to perceived problems with the sector—problems including cost, access, and quality of education.

In July 1998, the federal government released a preliminary statement, *Towards an Australian Strategy for the Information Economy* (*www.noie.gov.au/nationalstrategy/resource.html*). The document lists the government's 10 strategic priorities "to achieve its vision for the information economy," two of which deal with education and/or training:

- Train our workforce to harness opportunities within the information economy.
- Unlock the market potential of the health and education sectors.

Responses to the policy statement, while agreeing that education and training were key building blocks for an information economy, again raised concerns about funding priorities and inadequate infrastructure. EdNA (*www.noie.gov.au/nationalstrategy/submit32.html*) argued the key impediments to effective participation in the information economy were:

- Lack of universally accessible infrastructure at an affordable price for educational institutions; inadequate access to dedicated high bandwidth communications in the post-secondary sector; domestic shortages of skills and the professional development to address the lack of understanding of the technology.

- Lack of high-quality, locally generated online content, applications, and services.

EdNA called for "co-ordinated action to address the key roadblocks," saying that in the education and training sector, this must involve actions by governments:

> Commonwealth, state, and territory governments must commit the necessary resources to remove the impediments to effective participation in the information economy by the education and training sector. This will require both readjustments of funding priorities and additional funding commitments. In order to ensure that these resources are used effectively a national plan of action must be developed to provide a high level strategic focus for activities across the sector.

The July statement followed the earlier release (December 1997) of the Australian Government's policy document "Investing for Growth" which Prime Minister John Howard proclaimed a major step in ensuring the country could make the most of the opportunities offered by the 21st century. Education and training was one of four sectors identified in that document as a major focus in the endeavour to "get Australia online" (the others being government, community, and business).

Education and training (at school, TAFE, and university levels) was to be targeted as an "essential foundation to create a workforce with the requisite skills" to compete in the information economy. Measures announced included an analysis of current ICT skills of school students, $600,000 for a community access pilot project to introduce the education community to the uses of technology in education in rural and socio-economically disadvantaged areas, and the donation of surplus government ICT products to schools.

There can be no argument with the notion that access to ICT and information and technology literacy skills needs to be provided to workers and students. However, this document appeared to situate the need for these skills solely in terms of the dollar benefits they are likely to bring the community. There is no discussion of pedagogical or learner-led need for such change.

However, both documents are consistent with stated government objectives to get Australian education online and to move funding away from traditional "bricks and mortar" institutions. The preference expressed is for virtual, online, or technology-dependent education solutions, preferably offered in cross-sectoral collaborative ventures involving various post-secondary institutions and industry partners, and delivering to a global market.

In the Making

One difficulty with analysis of the state of virtual education in Australia is that developments are ongoing. While there may be no clearly defined virtual institutions apparent at present, a number of institutions and projects are working towards that aim. It is appropriate, then, to consider some projects "in the making," which are at various stages of the virtualisation continuum.

AsiaSpace

The AsiaSpace Trials Project appears to hold considerable promise for those nations and organisations for which heavy bandwidth, telecommunications, and electricity-intensive technology options are problematic. Ironically, its supporters report great difficulty in interesting Australian content providers in the project because it is not technologically intensive or interactive enough.

The project involves the use of AsiaSpace, a point-to-point multi-point satellite service, which has the capacity to deliver data to fixed and mobile locations in remote regions without power or phone. The wireless broadcast system operates through the use of the satellite and low-cost, transistor radio-sized digital receivers with external antenna (audio only) and a PC adaptor (data and multimedia services). The system is

specifically designed to deliver services to homes, buildings, and vehicles in areas with traditionally poor access to traditional broadcasting and telecommunications infrastructure.

The Australian trial, due to get underway after the satellite is launched in mid-1999, involves a collaboration of industry (AsiaSpace and WorldSpace), educational providers (Murdoch University, South Metropolitan College of TAFE), research groups (Centre for International Research in Communications and Information Technologies), and government bodies (Office of Information and Communications, Department of Commerce and Trade, Regional Development Commissions). The trial will involve the creation of distributed virtual classrooms in remote areas of Western Australia (including indigenous communities, remote islands and mine sites, rural fishing communities, remote households, and ships at sea). For the purposes of the trial, the technology will be used to deliver some university courses into Asia. Educational content will be provided from the TAFE and Murdoch University partners, along with radio broadcast services and a virtual edition of *The Land*, a nationally distributed rural issues based newspaper.

Admissions Database

In support of calls for greater national student mobility by the federal department responsible for university (but not TAFE) funding, the state-based tertiary admissions centres plan to assemble a Web database of national subjects and courses and hot-link course information to other courses across the country (*The Australian HES*, October 28, 1998, p. 37).

Virtual TAFE

As stated previously, Victoria has become one of the most advanced states in Australia in the development of the new technologies and has been in the forefront of linking its educational establishments via communications technology.

Its planned TAFE Online 2001 project, representing some 30 TAFE colleges as well as private providers, will be a Web-based campus (TAFEVC) catering for external students outside Victoria, including overseas. The system is designed to allow students to choose a course, enrol, access materials, join discussion groups, and submit assignments. Per subject costs would be identical to on-campus costs ($40 per subject).

A limited number of course materials have been developed at this stage in Business Studies, Hospitality, and Electronics, which are the most popular of TAFE's internal courses, and which have a high number of students in the workforce, where non-campus based education is an attractive option to employers. Equity and access issues are acknowledged through the establishment of planned learning centres across the state, similar to the QOLN centres in Queensland.

The Education Minister is adamant that the advent of TAFEVC will not diminish on-campus provision, although on-campus students will be urged to utilise the system. Mr. Honeywood said, "This is an additional tool intended to put flesh on the bones of the rhetoric about lifelong learning." Its development, he said, had been driven by access issues for the disadvantaged and housebound, although as stated above, employers wanting less down-time for trainees were a driving force as well. The amount of funding allocated for professional development for staff constitutes only $2 million (although it was initially reported at a generous $10 million), and only $4 million has been earmarked for curriculum development (*Campus Review*, October 14–20, 1998, p. 3).

Schools

In the schools sector, Victoria also appears to be leading the way. A deal was recently announced (*Campus Review*, October 28–November 3 1998,

p. 4) between the Education Department, Acer, and Apple to supply all teachers (including TAFE teachers) with laptops via a lease arrangement with their schools for $3 per week, on the proviso that they first undertake 40 hours of training. Acer will commit up to $15 million a year in Victoria for research and development into local multimedia applications. In November 1998, 11,000 computers were to be delivered in the first tranche, with science and technology teachers the first priority. This is an example of the sort of private-public co-operation we predicted in *New Media and Borderless Education*, and seems likely to play a major part in staff development and familiarity with new technologies.

In Queensland, central departmental initiatives include ConnectEd, designed to allow all primary and secondary state schools Internet access by the end of 1999. This will necessarily involve subsidies for telecommunications costs, as many remote schools are disadvantaged by STD charges to the nearest ISP provider. Currently, the majority of students have only one-hour-a-week access to a computer in the classroom because of the shortage of computers and large numbers in classes.

Most state education departments are planning on a ratio of one computer to five pupils at high school and one to ten at primary level by 2002.

Universities

The University of Southern Queensland (USQ) is one of several regional universities with an existing strong distance education provision to decide on a future as an online institution. Others include Central Queensland University, Charles Sturt, and Monash, although none of these expects to be solely online.

USQ has high expectations of its improved external computer interface through USQConnect, and its use of FarSite, an audiographics system replacing SMART 2000, capable of delivering via the Internet (see *www.databeam.com*). In November 1998, USQ's commercial arm, INDELTA, received $200,000 from the federal government to launch a virtual campus initiative that would provide Web-based course delivery in Australia and overseas (*Campus Review*, November 18–24 1998, p. 4). The virtual campus is to be set up through a company called e-HIGHERed. *Campus Review* reported USQ would become the first Australian university to become a shareholder, with a 25% stake in the company, and that seven other Australian universities were negotiating with e-HIGHERed.

USQ Vice-Chancellor Peter Swannell said USQ would put 50 to 100 units on the Web in 1999, targeting full-fee paying overseas students and fee-paying postgraduate Australian students. Swannell predicted modest enrolments in the virtual campus of 100 to 200 students in first semester 1999, and possible enrolments over the next three years of up to 2,500 students. In the same week, three USQ students graduated over the Internet (in an online ceremony) after completing a graduate certificate totally online. The students, two from Kuala Lumpur and one from Toowoomba, were the first to complete the Internet-based Graduate Certificate in Open and Distance Learning. About 300 students are currently enrolled in the course.

Telecommunications

The major telecommunications corporations in Australia are focusing on core business and at least one, Cable and Wireless Optus, is now approaching all educational sectors with a view to buying content for their cable carrier. Optus has approached all Australian universities, TAFEs, and schools in a bid to establish a relaunched education channel to operate from March 1999, from 10 a.m. to 8 p.m., with Australian content. The channel will be bundled free with the Disney channel and others. Optus intends to put only three

hours of U.S.-sourced education material on this channel, and it is looking for partners in developing Australian material.

Last Words

Perhaps, as suggested by Professor Tony Adams, director of Macquarie University's international centre, "Australia will be the home of the first global or regional universities." However, rather than being a virtual institution based on electronic delivery, Adams reportedly argues that the emerging global and regional university would be a "bricks and mortar" institution in which the virtual university will be an important part (*Campus Review*, October 7–13, 1998, p. 4). Regardless of whether or not government and institutional aspirations of global markets will be realised, Adams' model appears to be the most accurate in describing the current state of virtualisation in Australian education and training.

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11 Trends in the Virtual Delivery of Education in New Zealand and the Pacific Islands

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Introduction

New Zealand and the Pacific Islands are like every country in the world, finding that the key to their future economic advancement and cultural integrity depends on the way their people are educated. At the same time advances in information technology has a great impact on all aspects of our professional and private lives, changing the way we learn, do business, bank, shop, and play. Increasingly, society is global and digital in nature, and the key to socio-economic growth and success will be education based on telecommunications-networked environments.

The dilemma all societies face is that their education systems are designed to meet the needs of the industrial society of the past, not of the coming information society. We are preparing people for jobs, ideas, and values of a way of life that is fading away and for work in areas of shrinking labour requirements. What is needed is effective, cost-efficient instruction that matches the skills related to technological change, delivered interactively, at the convenience of the learner. This is distance education using new communications and information technologies (ICT)—virtual classes—so that no matter where people live, they can access education anytime, from anywhere. Equitable access means access to quality teachers and content to ensure effective learning outcomes.

What kind of education system is needed to prepare people for life in an information society? What will be the shape of education in the future? It is the search for answers that prompted John Tiffin and I to write our book in 1995, *In Search of the Virtual Class: Education in an Information Society*. (Routledge, 1995) in which these questions are explored more fully.

In this report, I examine the status of this new mode of delivery of education in New Zealand and the Pacific Islands. I argue that education is communication and I use the following benchmark, building on Lev Vygotsky's concept of the Zone of Proximal Development (Vygotsky, 1978). Vygotsky specifies three factors in the educational process:

1. Someone in the role of learner
2. Someone in the role of teacher
3. Something that constitutes a problem which the learner is trying to solve with the help of the teacher

By implication there is also a fourth factor: the knowledge needed to solve the problem. I suggest that it is the interaction of these four factors in a particular context that constitutes the fundamental communication process that is education. The virtual delivery of education is where the four factors of education can interact, using ICT to deliver the spoken word, written word,

and pictures in different locations. This is the communications environment that must be provided by a virtual institution.

New Zealand and the South Pacific share the global problem of the lack of equitable access to quality educational opportunity. We also have our own geographic, demographic, socio-economic, and cultural challenges. Isolation from the rest of the world is a major factor. Although the new information technology has eliminated the barriers of distance and time, access to technology continues to dog small island nations in the Pacific and, to a lesser extent, rural New Zealand. Among the critical issues are telecommunications penetration, tariff structures, lack of government funding, and no coherent ICT and education policies.

The region is one of great geographic, cultural, linguistic, political, and economic diversity, and the traditional dichotomy of developing and developed economies is becoming a less useful concept when considering the particular issues of virtual education. All societies are facing the need to adapt to rapid change brought about by ICT advancements, and no society, even the so-called developed ones, can justifiably claim that all sectors have equal access to the necessary technology.

Without access to technology, people are denied the capacity to build and develop human resources, a critical component of which is education and training opportunities. Disenfranchisement is a universal condition and women, indigenous peoples, and other minorities in this region are the most vulnerable.

New Zealand

New Zealand is one of the most deregulated economies in the world, and this is especially reflected in the telecommunications industry. However, its market-driven philosophy and the lack of coherent education and ICT policies has resulted in a serious deficiency in its ability to respond to the urgent need for educational reform. While New Zealand has one of the highest per capita telecommunications access in the developed world, and the highest proportion of Internet users, educational institutions and schools (primary, secondary, and tertiary) seriously lack access to ICT. In an increasingly user-pay environment, and with the stringent cuts in government funding, educational institutions can simply not afford ICT.

While many institutions have centrally administered e-mail, the management infrastructure to integrate ICT into curriculum is not present. However, there are a few departments in universities (e.g., in the Department of Communications at Victoria University, Wellington) where, with the help of industry, they have been researching, developing, and piloting online courses since 1995, using the Internet.

Current examples of virtual education

There are two reasons for educational institutions to use technology:

1. To offer instruction as effective and as high quality as the conventional classroom
2. To give access to educational opportunities to more people than is possible with current education systems, and therefore, to do so cost efficiently (in terms of unit costs).

Some examples of the application of technology in educational institutions in New Zealand are described here.

University sector

- *University of Wellington:* My colleague, Professor John Tiffin, and I in the Department of Communications Studies have been researching and teaching the application of ICT to education and training since 1986. We have published internationally, and have pioneered the implementation of virtual classes, virtual universities, and virtual learning organisations

on the Internet. We offer master's and doctorates in communications studies designed to equip New Zealand with a cadre of professionals in an increasingly competitive environment. The master's of communications is offered on the Internet nationally (and in the near future internationally) using cost-effective platforms and software (TalkShow and Vphone), providing synchronous and asynchronous seminars.

However, Victoria University, like all universities in New Zealand (except for Massey University), is a single-mode, face-to-face institution. Although there is an increasing effort to offer courses off-campus (mainly through audio-conferencing, face-to-face block courses, and video-conferencing via the Internet), the main thrust of such approaches is restricted to particular schools and departments. These initiatives rely on "champions" of the cause whose efforts to inspire colleagues is often very hard going in an economically punitive environment.

- *Massey University* is a dual-mode institution, with a larger enrolment in their off-campus courses than on-campus. However, the mode of delivery is mainly correspondence and attendance at block courses, and since 1992, a limited number of courses on educational television. However, Massey is currently exploring the use of multimedia and Web-based technologies in the area of open and flexible learning. For Massey, these developments are important because they will allow their courses to be electronically delivered at its other campuses. Waikato University and Massey University are piloting multi-campus teaching using computer networks, particularly ATM, to provide telepresence in off-campus sites.
- *Open Polytechnic of New Zealand* is New Zealand's first and only distance education (single-mode) tertiary institution. Since its inception in 1946 (named the New Zealand Technical Correspondence Institute) it has been print- and postal-based. In 1992, the Institute became the Open Polytechnic and sought to move into a computer-based environment. At present, about 40% of its courses are on disks and mailed to students, and the Open Polytechnic is gradually moving into a networked environment.
- *The Wellington Polytechnic* has established the Educational New Media Centre to spearhead the use of new media to improve and innovate open flexible learning initiatives for different learning styles in the polytechnic sector.

While all tertiary institutions are acutely aware of the need to incorporate ICT into learning, teaching, administration, and management subsystems, they lack trained staff, adequate finance, technology, and support systems, and most importantly, a vision, strategic thinking, and champions of the cause. While there are pockets of development, there is also a lack of co-ordination and collaboration among the universities as each institution competes with the others for government funding, which is predominantly based on the number of bodies on seats.

Schools Sector

The school sector faces similar issues in trying to integrate technology into curricula in a holistic and culturally appropriate manner. While the Minister of Education is committed to ensuring that schools are funded for ICT, the $4.6 million over three years for nearly 3,000 schools in New Zealand is grossly inadequate. The Ministry has recently launched the technology-in-schools project where four clusters of five schools each that have progressed in integrating technology in

curricula will mentor other schools that do not have these skills. If efficiently executed, this project could be very useful in disseminating ICT skills to all schools and facilitating teacher training in the use of technology.

The school sector appears to be more entrepreneurial than the tertiary sector, although all educational institutions at all levels are beginning to realise that if they do not make the move to integrate technology in curricula, the quality of education in this country will be seriously jeopardised.

- *Maori education:* In 1993, I was commissioned by the Ministry of Maori Development (Te Puni Kokiri) to develop a project that looked at the use of ICT for Maori education in the predominantly Maori population living in rural East Cape in New Zealand. The objective was to link the largest Maori School, Ngata Memorial College with 1,500 students to international and national databases and expert teachers in Physics, Chemistry, and Mathematics for Forms 6 and 7. Because of the few students in these classes, it was extremely difficult to retain teachers in the area. In short, my brief was to ensure that rural Maori students would be able to access the same quality of education available to the city-based students, in a culturally appropriate way. This project was very successful and linked three schools, the marae (meeting house) and Wananga (higher education institute) in a 600-kilometre area. The audiographic conferencing system that we had designed, tested, and used at Victoria University was extended to link most Maori schools from the north and south islands, which lead to the birth of the "clustering" concept.

  Telecom New Zealand, who sponsored the project, adopted the research and established the IT Schools Education section. Telecom has sponsored a number of IT schools competitions, which has lead to several school clusters gaining funding for computers and telecommunications infrastructures.
- *The Cantatech Project* is a notable initiative in New Zealand involving a group of rural schools in Canterbury (South Island) that captured the vision of the virtual class and actively planned to make it a reality. The project enabled students to have remote access to specialists, teachers to provide effective learning over the telephone, businesses to deliver affordable, stable, and easy-to-use technologies, and government to encourage schools to explore new models of learning. Those involved are pioneers who are successfully reaching out to settlers and sharing experiences in tele-learning with all New Zealand schools.
- *The Correspondence School* was founded in 1922 to service New Zealand's dispersed populations. It was correspondence based and was supplemented by school radio broadcasts. It provided vital and effective schooling, not only for New Zealanders living in isolated communities but also, in the 1980s, for over 600 students in the Pacific Islands. Essentially, parents took charge of the teaching based on the Correspondence School lessons delivered by the postal system. Periodically, a Correspondence School regional teacher would visit the homestead to advise and monitor the process.

  In order to ensure its future, the Correspondence School is involved in exploring tele-learning and has used CD-ROMS, videos, and disks and has even explored the use of broadcast satellite. (Land line telecommunication is not an economical option in the mostly mountainous areas of the Correspondence School constituents.) However,

the demographics have changed and have affected the Correspondence School's original mandate. Increasingly, the dropouts of conventional classrooms, the truants, the "difficult" children, and the adult dropouts seeking a second chance education make up the school's enrolees.

There is another problem. In the 1990s, New Zealand faced its most severe unemployment ever. Many people, through necessity or choice, moved to rural areas. Eighty percent of Correspondence School children in rural areas (1998) live with a solo parent. Not only are resources to technology scarce, there is often not the support of a skilled parent to provide the motivation and discipline so needed for distance education. Later this year, the Correspondence School year will be reviewed by ministerial audit as part of the future of distance education schooling.

Pacific Islands

In the Pacific Islands, the most significant provider of virtual delivery of education is the Extension Unit of the University of the South Pacific (USP) in Suva, Fiji. It has had this role of providing distance and continuing education since the 1980s. The formal higher education programmes were delivered face to face either with students from the 12 island states physically attending classes in Suva or with instructors visiting the centres.

Since the late 1980s, USP has used a satellite network (USPNet) that links five centres: Lautoka, Fiji; Cook Islands; Tonga; Vanuatu; and Samoa, to the Suva studio. Samoa is patched in via high frequency radio, and the link is used for weekly administration meetings and point-to-point sessions between two people on request. ICT is increasingly used for data transmission and enrolments are logged in at five centres and downloaded in Suva. Suva staff provide basic training for staff at the centres by "talking them through" various problems associated with the satellite link. (All satellite discussion is audio only.)

Material development, production, and distribution

The section responsible for design and development communications with the course writers at the two campuses in Samoa and Vanuatu is mainly by point-to-point discussion or team teleconferencing. Increasingly, draft attachments are exchanged through e-mail. Similarly, some courses (drafts and manuscripts) developed in Suva are sent electronically, and in the near future videos will be included in the courses. Efforts are being made to move into multimedia in the near future.

Management and administration communications within University Extension and the production and distribution are becoming fully computerised.

Delivery and tuition

The four time zones and two sides of the dateline in the region present significant challenges. Satellite tutorials are held up to 7 p.m. on Tuesdays to Fridays, and on Mondays for students on the same dateline as Fiji. However, public transport being very limited in the evening, students find it a serious problem attending the centres. A few courses are beginning to use CD-ROM and the Internet.

The most significant operation is the assignment traffic, with daily assignments from 12 centres. A specially designed programme is used to log in and out and to track the movement of the assignments, and to monitor the turnaround times of marked assignments.

Career counselling and student support

A beginning is being made to use the student record systems to counsel students, although career counselling is usually done at the centres. E-mail and satellite are used to communicate with students. It is proposed to have videoconferencing facilities in the year 2000 with the new standalone satellite network (funded by the governments of Australia, Japan, and New Zealand). This will provide voice, video, and datacommunications in a dedicated system.

Education focus

Most courses are degree level, provided off and on campus. Two courses are offered at Forms 6 and 7 using study packages. A few certificate and diploma courses are offered for teachers, as well as some continuing (non-credit) programmes tailored to specific needs (e.g., computer awareness, creative writing, arts and crafts).

Conclusion

Transport technologies provided the infrastructure for conventional classrooms and traditional distance education, and telecommunications networks will provide the infrastructure for virtual education. The virtual class can provide effective, cost-efficient learning opportunities to more people than is possible in the conventional classroom or by traditional distance education based on print and transportation technologies.

New Zealand and the Pacific Islands are well aware of the need for a paradigm shift in education delivery, but are grappling with the worldwide problem of a lack of resources to provide equitable access to information technology. More specifically, the following issues must be faced:

- A policy for ICT in education: Tariffs and cost categories for off-campus and on-campus delivery of education.
- Pedagogy: Teacher training in the use of technology; instructional design and development; teacher and student support.
- Institutional change: Allocation of funds for the new pedagogy; vision for the virtual class; a shift in institutional culture in a competitive environment; commercialisation of education (i.e., who will pay?).
- Accreditation of courses.
- Technological challenges: Hardware, software compatibility issues; training and maintenance; bandwidth; ongoing technical support; access to the technology (equity issues).
- Culture (remembering that there are many diverse paths to the development of virtual institutions).
- Intellectual property rights and technological proprietary rights: Who owns the courses? Will implementation be stalled because of proprietary rights of technology?

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